

Intro to OS: Web Scraper

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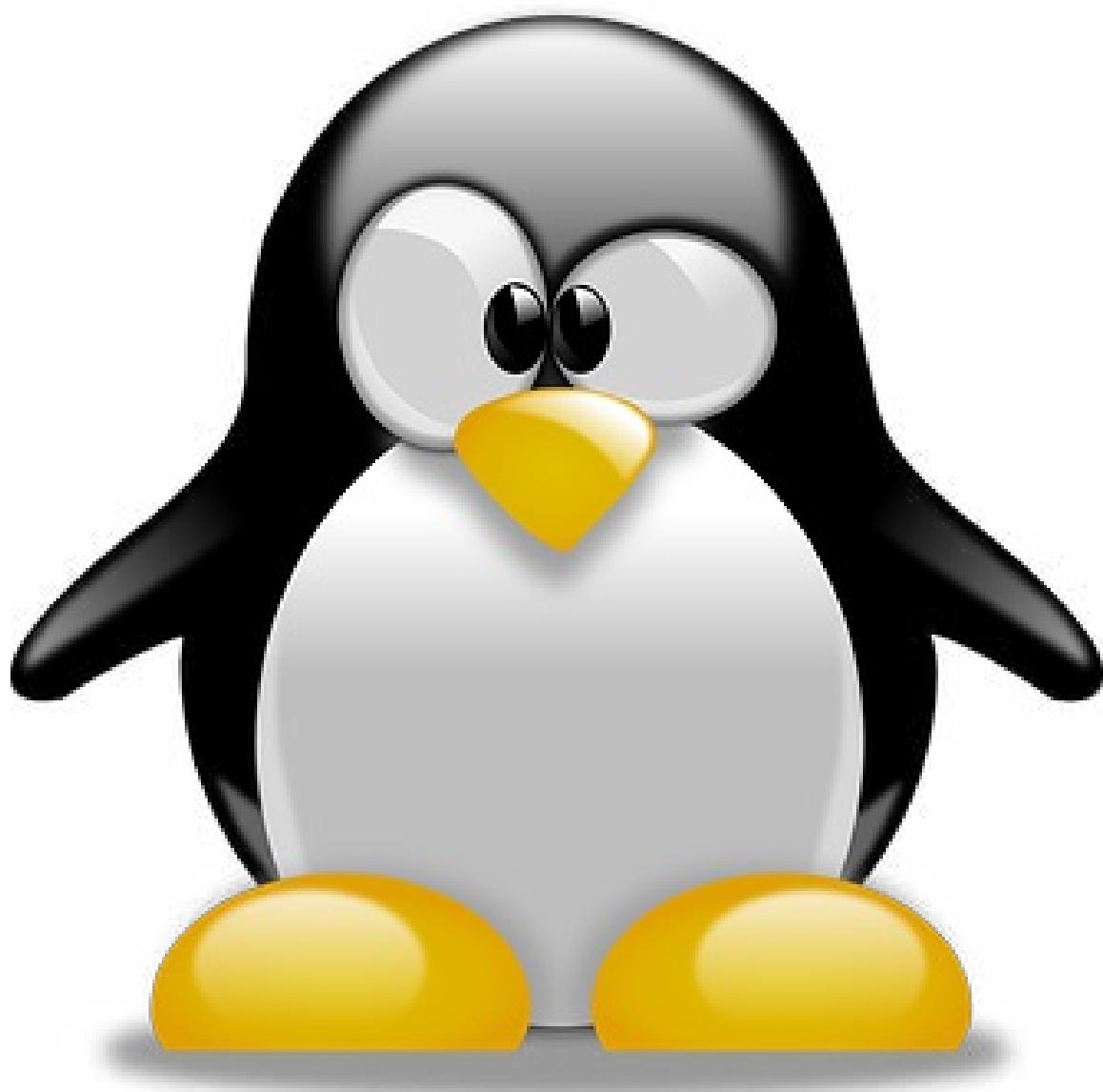


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Burroughs MCP	Concurrency (computer science)
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Bus error	Context switch
Busy waiting	Control Data Corporation
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Control theory
Control variable (programming)
Control-C
Cooperative multitasking
Coupled human?environment system
Crash (computing)
Credit card
Cross-validation (statistics)
Cryptography
Curlie
Cursor (user interface)
Cybernetics
Cyberwarfare
DECnet
DOS/360
DVD
Daemon (computing)
Data buffer
Data mining
Data storage
Database
Dave Cutler
Debian
Decision support system
Defense Advanced Research Projects Agency
Defragmentation
Dependability
Deterministic system
Device driver
Device file
Device register
Digital Equipment Corporation
Digital art
Digital library
Digital marketing
Direct memory access
Directory (computing)
Directory structure
Discrete mathematics
Disk operating system
Disk partitioning
Distributed artificial intelligence
Distributed computing
Distributed operating system
Division by zero
Document management system
Doi (identifier)
Domain Name System
Domain-specific language
Donella Meadows
Doubling time
Dynamical system
E-commerce
ECos
ESound
ETH Z~~o~~rich
EXEC 8
Earth system science
Economic system
Ecosystem
Edsger W. Dijkstra
Educational technology
Edward Norton Lorenz
Electronic design automation
Electronic publishing
Electronic voting
Embedded operating system
Embedded system
Emulator
Energy system
Enterprise information system
Enterprise software
Eric Trist
Event (computing)
Exception handling
Executive Systems Problem Oriented Language
Exokernel
Ext3
Ext4
Faina Mihajlovna Kirillova
Federal Information Processing Standards
File attribute
File locking
File system
File transfer protocol
Firewall (networking)
Firmware
Fixed-priority pre-emptive scheduling
Forensic software engineering
Formal language
Formal methods
Formal system
Francisco Varela
Fred Emery
Free Software Foundation
Free software
FreeBSD
FreeMint
GM-NAA I/O
GNOME
GNU Hurd
GNU Project
General Comprehensive Operating System
General Electric
General protection fault
Geographic information system
George Dantzig
George Klir
Glossary of operating systems terms
Google
Government of the United States
Graphical user interface
Graphics processing unit
Green computing
Green500
Gregory Bateson
HP-UX
Haiku (operating system)
Hard disk drive
Hard disk drives

Hardware abstraction
Hardware acceleration
Health informatics
Heinz von Foerster
Hexadecimal
History of IBM mainframe operating systems
History of operating systems
Hobbyist operating system
Holon (philosophy)
Homebrew Computer Club
Honeywell
Howard T. Odum
Human body
Human-computer interaction
Humberto Maturana
Hybrid kernel
Hypervisor
IA-32
IBM
IBM 1410
IBM 7010
IBM 704
IBM 7040
IBM 709
IBM 7090
IBM 7090/94 IBSYS
IBM AIX
IBM Airline Control Program
IBM Personal Computer
IBM Power Systems
IBM System/360
IBM System/360 Model 67
IBM i
INT (x86 instruction)
IOS
IP address
ISBN (identifier)
ISO 9660
Ilya Prigogine
Image compression
Infinite loop
Information retrieval
Information security
Information system
Information theory
Inode
Input and output
Input device
Input/Output
Input/output
Institution of Engineering and Technology
Integrated circuit
Integrated development environment
Intel 80386
Intel Corporation
Inter-process communication
Interaction design
Interpreter (computing)
Interrupt
Interrupt handler
Interrupt request (PC architecture)
Interrupt vector table
Interruptible operating system
Intrusion detection system
Itanium
James Grier Miller
James J. Kay
Java (software platform)
Jay Wright Forrester
Jennifer Wilby
John Seddon
John Wiley & Sons
Journaling file system
Just enough operating system
Jörg Gutknecht
KDE
KDE Plasma 5
Kathleen Carley
Katia Sycara
Keith Bostic (software engineer)
Ken Thompson
Kenneth E. Boulding
Kernel (operating system)
Kevin Warwick
Keyboard (computing)
Knowledge representation and reasoning
Library (computing)
Light-weight Linux distribution
Lightweight Directory Access Protocol
Limiting factor
Linker (computing)
Linus Torvalds
Linux
Linux Mint
Linux distribution
Linux kernel
List of important publications in computer science
List of national legal systems
List of operating systems
List of pioneers in computer science
List of systems sciences organizations
List of systems scientists
Live CD
Live USB
Living systems
Loadable kernel module
Logic in computer science
Ludwig von Bertalanffy
Lydia Kavraki
MCP (Burroughs Large Systems)
MCP/ClearPath
MINIX
MIT
MKS Inc.
MOS Technology 6502
MS-DOS
MULTICS
MUSIC/SP
MVS
MVS/ESA

Mac OS X Lion
Mac OS X Server 1.0
Mac OS X v10.0
MacOS
MacOS Server
Mach (kernel)
Machine code
Machine learning
Macintosh
Magnetic tape
Mainframe computer
Mainframe computers
Manchester Mark 1
Manfred Clynes
Manuela M. Veloso
Margaret Boden
Margaret Mead
Mary Cartwright
Mass storage
Mathematical analysis
Mathematical optimization
Mathematical software
Memory address
Memory allocation
Memory management
Memory management (operating systems)
Memory paging
Memory protection
Memory segmentation
Message transfer agent
Metric system
Michigan Terminal System
Microcode
Microcomputer
Microcontroller
Microkernel
Microprocessor
Microsoft
Microsoft Windows
Middleware
Midrange computer
Mihajlo D. Mesarovic
Mike Jackson (systems scientist)
Minicomputer
Minix 3
Mixed reality
Mnemonic
Mobile device
Mobile operating system
Model of computation
Modeling language
Modular programming
Monolithic kernel
MontaVista
MorphOS
Motherboard
Mouse (computing)
Multi-agent system
Multi-task learning
Multi-user
Multics
Multikernel
Multilevel feedback queue
Multimedia database
Multiprocessing
Multithreading (computer architecture)
Murray Bowen
NEXTSTEP
NOS (software)
NTFS
NTFS-3G
Natural language processing
NeXT
NeXTSTEP
Negative feedback
Nervous system
NetBSD
Network File System
Network architecture
Network operating system
Network performance
Network protocol
Network scheduler
Network security
Network service
Networking hardware
Niklas Luhmann
Niklaus Wirth
Non-volatile memory
Non-volatile storage
Nonlinear system
Norbert Wiener
Numerical analysis
OEM
ORVYL
OS 2200
OS/2
OS/360
OS/360 and successors
Oberon (operating system)
Object-oriented operating system
Open core
Open-source software
OpenBSD
OpenVMS
Operating System Projects
Operating environment
Operating system
Operating system abstraction layer
Operations research
Outline of computer science
Output device
P-code machine
PC DOS
PDP-11
PLATO (computer system)
POSIX
Page fault
Paging
Palm OS

Parallel computing
Penguin
Per Brinch Hansen
Peripheral
Personal computer
Personal computer hardware
Personal digital assistant
Peter Senge
Philosophy of artificial intelligence
Photo manipulation
PikeOS
Plan 9 from Bell Labs
Planetary system
Plugboard
Political system
Polling (computer science)
Popek and Goldberg virtualization requirements
Ported
Positive feedback
Preboot Execution Environment
Preemption (computing)
Preemptive multitasking
Prentice Hall
Principia Cybernetica
Printed circuit board
Printer (computing)
Probability
Process (computing)
Process control
Process control block
Process identifier
Process management (computing)
Processor register
Program counter
Programmable Interrupt Controller
Programming language
Programming language theory
Programming paradigm
Programming team
Programming tool
Proprietary software
Protected mode
Protection ring
Punched tape
QNX
Qian Xuesen
Qt (software)
RISC OS
RSX-11
RT-11
RTLinux
Radhika Nagpal
Random access memory
Random-access memory
Randomized algorithm
ReactOS
Read-only memory
Readers?writers problem
Real-time computing
Real-time operating system
Red Hat Enterprise Linux
Reinforcement learning
Reiser4
ReiserFS
Remote procedure call
Rendering (computer graphics)
Requirements analysis
Resident monitor
Richard E. Bellman
Richard Stallman
Round-robin scheduling
Rump kernel
Runtime library
Russell L. Ackoff
Ruzena Bajcsy
S2CID (identifier)
SCOPE (software)
SCSI RDMA Protocol
SHARE Operating System
SIGBUS
SIGSEGV
SPARC
Sabre (computer system)
Samba (software)
Sandbox (computer security)
Scheduler (computing)
Scheduling (computing)
Secure Shell
Security service (telecommunication)
Security-focused operating system
Segmentation fault
Segmentation violation
Semantics (computer science)
Sensory system
Server (computing)
Server message block
Shell (computing)
Shortest job next
Signal (IPC)
Single address space operating system
Single-board computer
Singularity (operating system)
Smartphone
Smartwatch
Social computing
Social software
Social system
Sociotechnical system
Software
Software architecture
Software configuration management
Software construction
Software deployment
Software design
Software development
Software development process
Software engineering
Software framework
Software interrupt
Software maintenance

Software platform
Software portability
Software quality
Software repository
Solaris (operating system)
Solid modeling
Solid state drives
Sorting algorithm
Sperry Rand
Spooling
Stack machine
Star system
Statistics
Status message
Status register
Stephanie Forrest
Steve Jobs
Sun Microsystems
Supercomputer
Supercomputer operating system
Supervised learning
Supervisor mode
Syllable Desktop
Symbian
Synthography
System
System Commander
System V
System call
System dynamics
System image
System library
System of measurement
System on a chip
System resource
System software
Systemics
Systems Network Architecture
Systems analysis
Systems art
Systems biology
Systems ecology
Systems engineering
Systems neuroscience
Systems pharmacology
Systems philosophy
Systems psychology
Systems science
Systems theory
Systems theory in anthropology
Systems theory in archaeology
Systems theory in political science
Systems thinking
TOPS-10
TOPS-20
TOS/360
TSS/360
Tablet computer
Talcott Parsons
Tandem
TempleOS
The Open Group
Theoretical computer science
Theory of computation
Thomas E. Anderson
Thread (computing)
Tim Berners-Lee
Time slice
Time-sharing
Timeline of operating systems
Transaction Processing Facility
Trusted Computer System Evaluation Criteria
Trusted operating system
Tux (mascot)
Twelve leverage points
UNIVAC
UNIVAC 1108
UNIX
UNIX System Services
USB flash drive
Ubiquitous computing
Ubuntu (operating system)
Unikernel
Unisys
United States Department of Defense
Universal Disk Format
Universal Turing machine
University of California, Berkeley
Unix
Unix-like
Unsupervised learning
Urban metabolism
Usage share of operating systems
Usenet newsgroup
User (computing)
User interface
User mode
User space
User space and kernel space
VAX
VMS Software Inc
Very Large Scale Integration
Video game
Virtual file system
Virtual machine
Virtual memory
Virtual reality
Virtual tape library
Visualization (graphics)
Vkernel
VxWorks
WIMP (computing)
Wayback Machine
Web server
Webserver
William Ross Ashby
Windows 11
Windows 3.x
Windows 95
Windows 9x

Windows CE
Windows ME
Windows NT
Windows NT 4.0
Windows Server 2003
Windows Server 2008 R2
Windows Vista
Windows XP
Windows shell
Windows shell replacement
Word processor
Workstation
World Wide Web
World-systems theory
Writing system
X Window System
X86
X86-64
XTS-400
Z/Architecture
Z/OS
Z/VM

16-bit computing

In computer architecture, 16-bit integers, memory addresses, or other data units are those that are 16 bits (2 octets) wide. Also, 16-bit central processing unit (CPU) and arithmetic logic unit (ALU) architectures are those that are based on registers, address buses, or data buses of that size. 16-bit microcomputers are microcomputers that use 16-bit microprocessors.



32-bit computing

In computer architecture, 32-bit computing refers to computer systems with a processor, memory, and other major system components that operate on data in 32-bit units. Compared to smaller bit widths, 32-bit computers can perform large calculations more efficiently and process more data per clock cycle. Typical 32-bit personal computers also have a 32-bit address bus, permitting up to 4 GB of RAM to be accessed; far more than previous generations of system architecture allowed. 32-bit designs have been used since the earliest days of electronic computing, in experimental systems and then in large mainframe and minicomputer systems. The first hybrid 16/32-bit microprocessor, the Motorola 68000, was introduced in the late 1970s and used in systems such as the original Apple Macintosh. Fully 32-bit microprocessors such as the HP FOCUS, Motorola 68020 and Intel 80386 were launched in the early to mid 1980s and became dominant by the early 1990s. This generation of personal computers coincided with and enabled the first mass-adoption of the World Wide Web. While 32-bit architectures are still widely-used in specific applications, their dominance of the PC market ended in the early 2000s.



64-bit computing

In computer architecture, 64-bit integers, memory addresses, or other data units are those that are 64 bits wide. Also, 64-bit CPUs and ALUs are those that are based on processor registers, address buses, or data buses of that size. A computer that uses such a processor is a 64-bit computer.



80286

The Intel 80286 (also marketed as the iAPX 286 and often called Intel 286) is a 16-bit microprocessor that was introduced on February 1, 1982. It was the first 8086-based CPU with separate, non-multiplexed address and data buses and also the first with memory management and wide protection abilities. The 80286 used approximately 134,000 transistors in its original nMOS (HMOS) incarnation and, just like the contemporary 80186, it could correctly execute most software written for the earlier Intel 8086 and 8088 processors. The 80286 was employed for the IBM PC/AT, introduced in 1984, and then widely used in most PC/AT compatible computers until the early 1990s. In 1987, Intel shipped its five-millionth 80286 microprocessor.



ACM Computing Classification System

The ACM Computing Classification System (CCS) is a subject classification system for computing devised by the Association for Computing Machinery (ACM). The system is comparable to the Mathematics Subject Classification (MSC) in scope, aims, and structure, being used by the various ACM journals to organize subjects by area.



Representing a Computer Science Research Organization on the ACM Computing Classification System

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Susana Nascimento and Luis Moniz Pereira
Computer Science Department and Centre for Artificial Intelligence
(CENTRIA)
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
Portugal



ALGOL

ALGOL (; short for "Algorithmic Language") is a family of imperative computer programming languages originally developed in 1958. ALGOL heavily influenced many other languages and was the standard method for algorithm description used by the Association for Computing Machinery (ACM) in textbooks and academic sources for more than thirty years. In the sense that the syntax of most modern languages is "Algol-like", it was arguably more influential than three other high-level programming languages among which it was roughly contemporary: FORTRAN, Lisp, and COBOL. It was designed to avoid some of the perceived problems with FORTRAN and eventually gave rise to many other programming languages, including PL/I, Simula, BCPL, B, Pascal, and C.



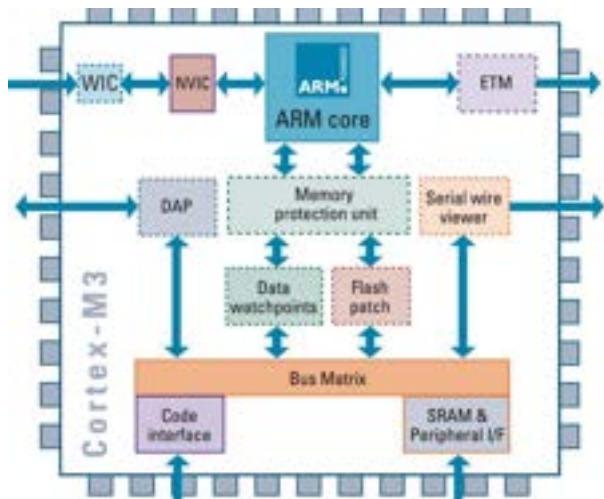
API

An application programming interface (API) is a way for two or more computer programs to communicate with each other. It is a type of software interface, offering a service to other pieces of software. A document or standard that describes how to build or use such a connection or interface is called an API specification. A computer system that meets this standard is said to implement or expose an API. The term API may refer either to the specification or to the implementation.



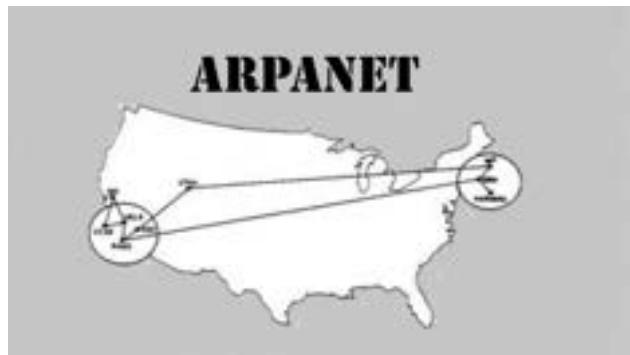
ARM architecture

ARM (stylised in lowercase as arm, formerly an acronym for Advanced RISC Machines and originally Acorn RISC Machine) is a family of reduced instruction set computer (RISC) instruction set architectures for computer processors, configured for various environments. Arm Ltd. develops the architectures and licenses them to other companies, who design their own products that implement one or more of those architectures, including system on a chip (SoC) and system on module (SOM) designs, that incorporate different components such as memory, interfaces, and radios. It also designs cores that implement these instruction set architectures and licenses these designs to many companies that incorporate those core designs into their own products.



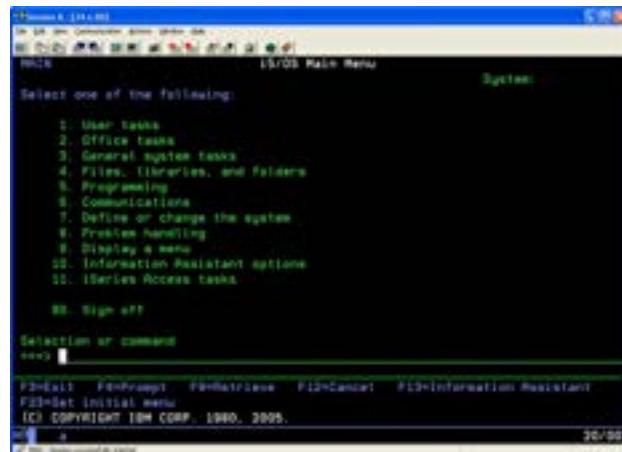
ARPANET

The Advanced Research Projects Agency Network (ARPANET) was the first wide-area packet-switched network with distributed control and one of the first networks to implement the TCP/IP protocol suite. Both technologies became the technical foundation of the Internet. The ARPANET was established by the Advanced Research Projects Agency (ARPA) of the United States Department of Defense. Building on the ideas of J. C. R. Licklider, Bob Taylor initiated the ARPANET project in 1966 to enable resource sharing between remote computers. Taylor appointed Larry Roberts as program manager. Roberts made the key decisions about the network design. He incorporated Donald Davies' concepts and designs for packet switching, and sought input from Paul Baran. ARPA awarded the contract to build the network to Bolt Beranek & Newman who developed the first protocol for the network. Roberts engaged Leonard Kleinrock at UCLA to develop mathematical methods for analyzing the packet network technology. The first computers were connected in 1969 and the Network Control Protocol was implemented in 1970. The network was declared operational in 1971. Further software development enabled remote login, file transfer and email. The network expanded rapidly and operational control passed to the Defense Communications Agency in 1975.



AS/400

The IBM AS/400 (Application System/400) is a family of midrange computers from IBM announced in June 1988 and released in August 1988. It was the successor to the System/36 and System/38 platforms, and ran the OS/400 operating system. Lower-cost but more powerful than its predecessors, the AS/400 was extremely successful at launch, with an estimated 111,000 installed by the end of 1990 and annual revenue reaching \$14 billion that year, increasing to 250,000 systems by 1994, and about 500,000 shipped by 1997. A key concept in the AS/400 platform is Technology Independent Machine Interface (TIMI), a platform-independent instruction set architecture (ISA) that is compiled along with the native machine language instructions. The platform has used this capability to change the underlying processor architecture without breaking application compatibility. Early systems were based on a 48-bit CISC instruction set architecture known as the Internal Microprogrammed Interface (IMPI), originally developed for the System/38. In 1991, the company introduced a new version of the system running on a 64-bit PowerPC-derived CPU, the IBM RS64. Due to the use of TIMI, applications for the original CISC-based programs continued to run on the new systems without modification. The RS64 was replaced with POWER4 processors in 2001, which was followed by POWER5 and POWER6 in later upgrades.



Abort (computing)

In a computer or data transmission system, to abort means to terminate, usually in a controlled manner, a processing activity because it is impossible or undesirable for the activity to proceed or in conjunction with an error. Such an action may be accompanied by diagnostic information on the aborted process. In addition to being a verb, abort also has two noun senses. In the most general case, the event of aborting can be referred to as an abort. Sometimes the event of aborting can be given a special name, as in the case of an abort involving a Unix kernel where it is known as a kernel panic. Specifically in the context of data transmission, an abort is a function invoked by a sending station to cause the recipient to discard or ignore all bit sequences transmitted by the sender since the preceding flag sequence.



Abstraction (software engineering)

In software engineering and computer science, abstraction is:

Abstraction	Encapsulation
<ul style="list-style-type: none">↳ Is used for hiding the unwanted data & giving relevant data -↳ What the object does	<ul style="list-style-type: none">↳ Means hiding the code.↳ Data into a single unit to protect data from outside world↳ how the object does

Alan Turing

Alan Mathison Turing (; 23 June 1912 ? 7 June 1954) was an English mathematician, computer scientist, logician, cryptanalyst, philosopher, and theoretical biologist. Turing was highly influential in the development of theoretical computer science, providing a formalisation of the concepts of algorithm and computation with the Turing machine, which can be considered a model of a general-purpose computer. He is widely considered to be the father of theoretical computer science and artificial intelligence. Born in Maida Vale, London, Turing was raised in southern England. He graduated at King's College, Cambridge, with a degree in mathematics. Whilst he was a fellow at Cambridge, he published a proof demonstrating that some purely mathematical yes/no questions can never be answered by computation and defined a Turing machine, and went on to prove that the halting problem for Turing machines is undecidable. In 1938, he obtained his PhD from the Department of Mathematics at Princeton University. During the Second World War, Turing worked for the Government Code and Cypher School (GC&CS) at Bletchley Park, Britain's codebreaking centre that produced Ultra intelligence. For a time he led Hut 8, the section that was responsible for German naval cryptanalysis. Here, he devised a number of techniques for speeding the breaking of German ciphers, including improvements to the pre-war Polish bomba method, an electromechanical machine that could find settings for the Enigma machine. Turing played a crucial role in cracking intercepted coded messages that enabled the Allies to defeat the Axis powers in many crucial engagements, including the Battle of the Atlantic.



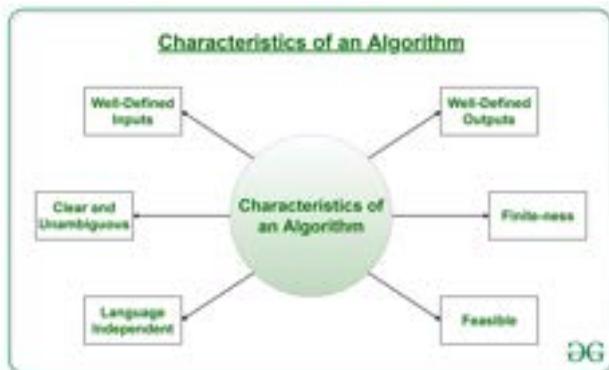
Alexander Bogdanov

Alexander Aleksandrovich Bogdanov
(Russian: ?????????? ??????????????
????????; 22 August 1873 [O.S. 10
August] ? 7 April 1928), born Alexander
Malinovsky, was a Russian and later Soviet
physician, philosopher, science fiction
writer, and Bolshevik revolutionary.



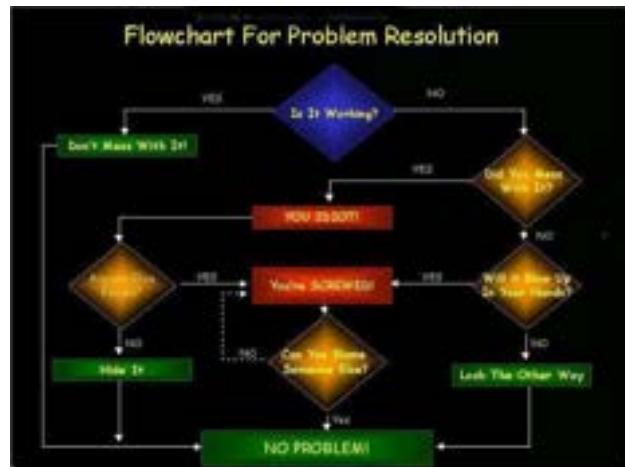
Algorithm

In mathematics and computer science, an algorithm (listen) is a finite sequence of rigorous instructions, typically used to solve a class of specific problems or to perform a computation. Algorithms are used as specifications for performing calculations and data processing. More advanced algorithms can use conditionals to divert the code execution through various routes (referred to as automated decision-making) and deduce valid inferences (referred to as automated reasoning), achieving automation eventually. Using human characteristics as descriptors of machines in metaphorical ways was already practiced by Alan Turing with terms such as "memory", "search" and "stimulus". In contrast, a heuristic is an approach to problem solving that may not be fully specified or may not guarantee correct or optimal results, especially in problem domains where there is no well-defined correct or optimal result. As an effective method, an algorithm can be expressed within a finite amount of space and time, and in a well-defined formal language for calculating a function. Starting from an initial state and initial input (perhaps empty), the instructions describe a computation that, when executed, proceeds through a finite number of well-defined successive states, eventually producing "output" and terminating at a final ending state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate random input.



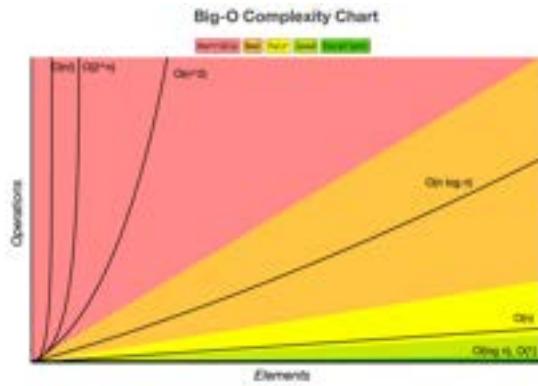
Algorithm design

In mathematics and computer science, an algorithm (listen) is a finite sequence of rigorous instructions, typically used to solve a class of specific problems or to perform a computation. Algorithms are used as specifications for performing calculations and data processing. More advanced algorithms can use conditionals to divert the code execution through various routes (referred to as automated decision-making) and deduce valid inferences (referred to as automated reasoning), achieving automation eventually. Using human characteristics as descriptors of machines in metaphorical ways was already practiced by Alan Turing with terms such as "memory", "search" and "stimulus". In contrast, a heuristic is an approach to problem solving that may not be fully specified or may not guarantee correct or optimal results, especially in problem domains where there is no well-defined correct or optimal result. As an effective method, an algorithm can be expressed within a finite amount of space and time, and in a well-defined formal language for calculating a function. Starting from an initial state and initial input (perhaps empty), the instructions describe a computation that, when executed, proceeds through a finite number of well-defined successive states, eventually producing "output" and terminating at a final ending state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate random input.



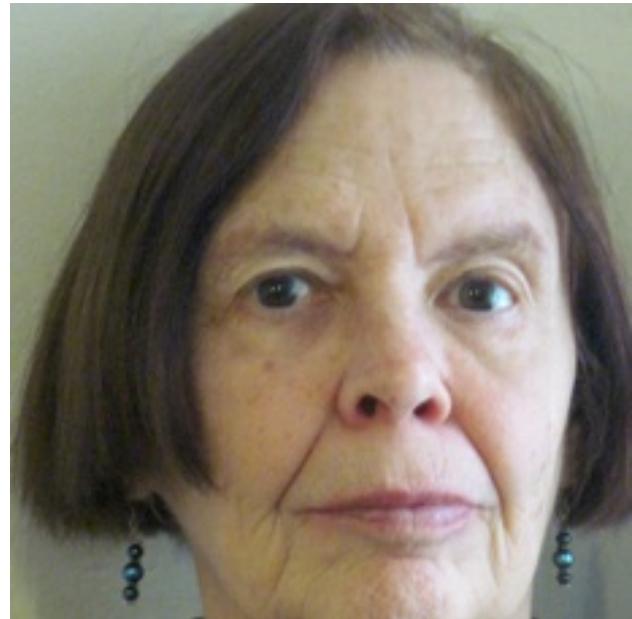
Algorithmic efficiency

In computer science, algorithmic efficiency is a property of an algorithm which relates to the amount of computational resources used by the algorithm. An algorithm must be analyzed to determine its resource usage, and the efficiency of an algorithm can be measured based on the usage of different resources. Algorithmic efficiency can be thought of as analogous to engineering productivity for a repeating or continuous process.



Allenna Leonard

Allenna Leonard is an American cyberneticist, consultant and director of Team Syntegrity International, specializing in the application of Stafford Beer's Viable System Model and Syntegration. She was president of the International Society for the Systems Sciences in 2009?2010, and led the organization of its 54th annual meeting in Waterloo, Canada.



American Airlines

American Airlines is a major US-based airline headquartered in Fort Worth, Texas, within the Dallas?Fort Worth metroplex. It is the largest airline in the world when measured by fleet size, scheduled passengers carried, and revenue passenger mile. American, together with its regional partners and affiliates, operates an extensive international and domestic network with almost 6,800 flights per day to nearly 350 destinations in more than 50 countries. American Airlines is a founding member of the Oneworld alliance, the third-largest airline alliance in the world. Regional service is operated by independent and subsidiary carriers under the brand name American Eagle. American Airlines and American Eagle operate out of 10 hubs, with Dallas/Fort Worth (DFW) being its largest. The airline handles more than 200 million passengers annually with an average of more than 500,000 passengers daily. As of 2021, the company employs 123,400 staff members.



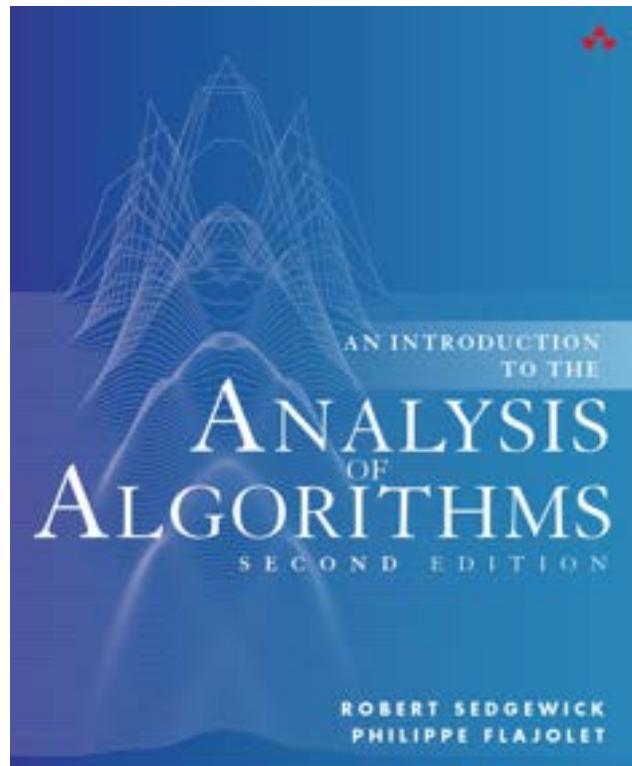
AmigaOS

AmigaOS is a family of proprietary native operating systems of the Amiga and AmigaOne personal computers. It was developed first by Commodore International and introduced with the launch of the first Amiga, the Amiga 1000, in 1985. Early versions of AmigaOS required the Motorola 68000 series of 16-bit and 32-bit microprocessors. Later versions were developed by Haage & Partner (AmigaOS 3.5 and 3.9) and then Hyperion Entertainment (AmigaOS 4.0-4.1). A PowerPC microprocessor is required for the most recent release, AmigaOS 4.



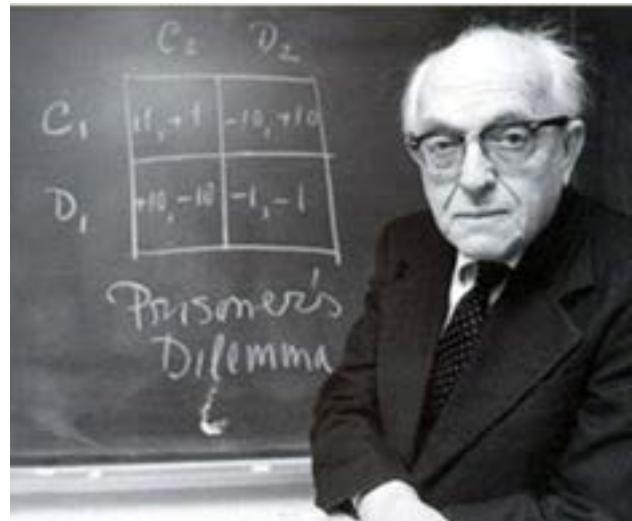
Analysis of algorithms

In computer science, the analysis of algorithms is the process of finding the computational complexity of algorithms—the amount of time, storage, or other resources needed to execute them. Usually, this involves determining a function that relates the size of an algorithm's input to the number of steps it takes (its time complexity) or the number of storage locations it uses (its space complexity). An algorithm is said to be efficient when this function's values are small, or grow slowly compared to a growth in the size of the input. Different inputs of the same size may cause the algorithm to have different behavior, so best, worst and average case descriptions might all be of practical interest. When not otherwise specified, the function describing the performance of an algorithm is usually an upper bound, determined from the worst case inputs to the algorithm.



Anatol Rapoport

Anatol Rapoport (Ukrainian: ??????????
????????? ??????????; Russian:
????????? ?????????? ??????????; May
22, 1911 ? January 20, 2007) was an
American mathematical psychologist. He
contributed to general systems theory, to
mathematical biology and to the
mathematical modeling of social interaction
and stochastic models of contagion.



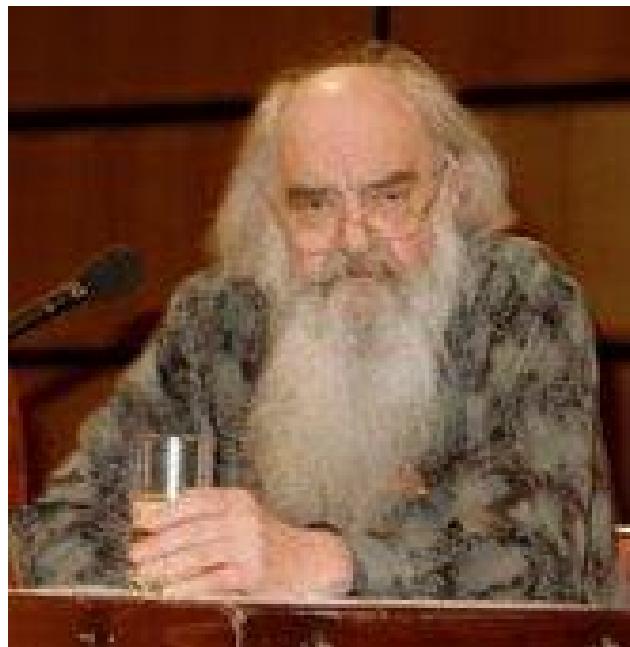
Android (operating system)

Android is a mobile operating system based on a modified version of the Linux kernel and other open-source software, designed primarily for touchscreen mobile devices such as smartphones and tablets. Android is developed by a consortium of developers known as the Open Handset Alliance, though its most widely used version is primarily developed by Google. It was unveiled in November 2007, with the first commercial Android device, the HTC Dream, being launched in September 2008.



Anthony Stafford Beer

Anthony Stafford Beer (25 September 1926 – 23 August 2002) was a British theorist, consultant and professor at the Manchester Business School. He is best known for his work in the fields of operational research and management cybernetics.



Anthony Wilden

Anthony George Wilden (14 December 1935 – 29 December 2019) was a writer, social theorist, college lecturer, and consultant. Wilden published numerous books and articles which intersect a number of fields, including systems theory, film theory, structuralism, cybernetics, psychiatry, anthropological theory, water control projects, urban ecosystems, resource conservation, and communications and social relations. Wilden is credited with one of the first significant introductions to the work of Jacques Lacan in the English-speaking world, particularly in his role as one of Lacan's early English translators. Today Wilden's work (and consequent reputation) is arguably more influential in the fields of communication theory, ecology and social interaction. These fields of study evolved out of a long scholarly tradition of "interactional semiotics" that originated with Plato's *Cratylus*. Along with such figures as Gregory Bateson (i.e., *Steps to an Ecology of Mind*), R. D. Laing (i.e., *Sanity, Madness and the Family*), and Walker Percy (i.e., *Lost in the Cosmos*), Wilden is considered one of this tradition's contemporary (modern and postmodern) pioneers. With the appearance of *System and Structure* (1972), Wilden sought "to establish the necessity of an ecosystemic or ecological approach to communication and exchange in open systems of all types", to use his own words. In hindsight it is recognized that *System and Structure* was an early contribution to a "theory of self-referential systems".



Apollo program

The Apollo program, also known as Project Apollo, was the third United States human spaceflight program carried out by the National Aeronautics and Space Administration (NASA), which succeeded in preparing and landing the first humans on the Moon from 1968 to 1972. It was first conceived in 1960 during President Dwight D. Eisenhower's administration as a three-person spacecraft to follow the one-person Project Mercury, which put the first Americans in space. Apollo was later dedicated to President John F. Kennedy's national goal for the 1960s of "landing a man on the Moon and returning him safely to the Earth" in an address to Congress on May 25, 1961. It was the third US human spaceflight program to fly, preceded by the two-person Project Gemini conceived in 1961 to extend spaceflight capability in support of Apollo.



Apple II

The Apple II (stylized as apple][) is an 8-bit home computer and one of the world's first highly successful mass-produced microcomputer products. It was designed primarily by Steve Wozniak; Jerry Manock developed the design of Apple II's foam-molded plastic case, Rod Holt developed the switching power supply, while Steve Jobs's role in the design of the computer was limited to overseeing Jerry Manock's work on the plastic case. It was introduced by Jobs and Wozniak at the 1977 West Coast Computer Faire, and marks Apple's first launch of a personal computer aimed at a consumer market?branded toward American households rather than businessmen or computer hobbyists.



Apple Inc.

Apple Inc. is an American multinational technology company headquartered in Cupertino, California, United States. Apple is the largest technology company by revenue (totaling US\$365.8 billion in 2021) and, as of June 2022, is the world's biggest company by market capitalization, the fourth-largest personal computer vendor by unit sales and second-largest mobile phone manufacturer. It is one of the Big Five American information technology companies, alongside Alphabet (Google), Amazon, Meta (Facebook), and Microsoft.



Application programming interface

An application programming interface (API) is a way for two or more computer programs to communicate with each other. It is a type of software interface, offering a service to other pieces of software. A document or standard that describes how to build or use such a connection or interface is called an API specification. A computer system that meets this standard is said to implement or expose an API. The term API may refer either to the specification or to the implementation.



Application security

Application security (short AppSec) includes all tasks that introduce a secure software development life cycle to development teams. Its final goal is to improve security practices and, through that, to find, fix and preferably prevent security issues within applications. It encompasses the whole application life cycle from requirements analysis, design, implementation, verification as well as maintenance.



Application software

An application program (software application, or application, or app for short) is a computer program designed to carry out a specific task other than one relating to the operation of the computer itself, typically to be used by end-users. Word processors, media players, and accounting software are examples. The collective noun "application software" refers to all applications collectively. The other principal classifications of software are system software, relating to the operation of the computer, and utility software ("utilities").



Artificial intelligence

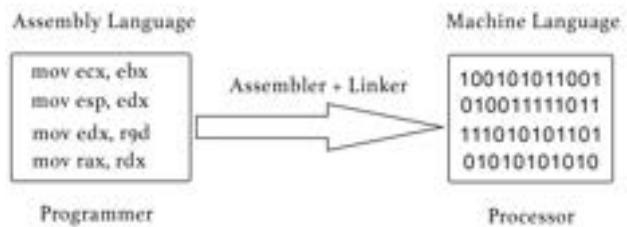
Artificial intelligence (AI) is intelligence? perceiving, synthesizing, and inferring information?demonstrated by machines, as opposed to intelligence displayed by non-human animals and humans. Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs.



Assembly language

In computer programming, assembly language (or assembler language, or symbolic machine code), often referred to simply as Assembly and commonly abbreviated as ASM or asm, is any low-level programming language with a very strong correspondence between the instructions in the language and the architecture's machine code instructions.

Assembly language usually has one statement per machine instruction (1:1), but constants, comments, assembler directives, symbolic labels of, e.g., memory locations, registers, and macros are generally also supported.



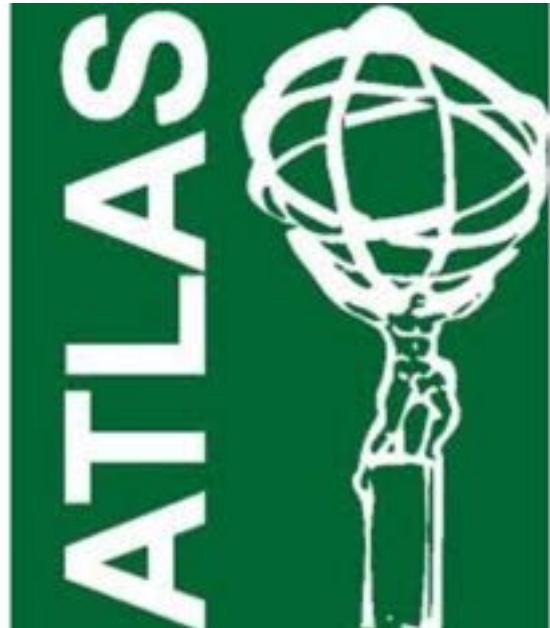
Atlas (computer)

The Atlas Computer was one of the world's first supercomputers, in use from 1962 (when it was claimed to be the most powerful computer in the world) to 1972. Atlas' capacity promoted the saying that when it went offline, half of the United Kingdom's computer capacity was lost. It is notable for being the first machine with virtual memory (at that time referred to as 'one-level store') using paging techniques; this approach quickly spread, and is now ubiquitous.



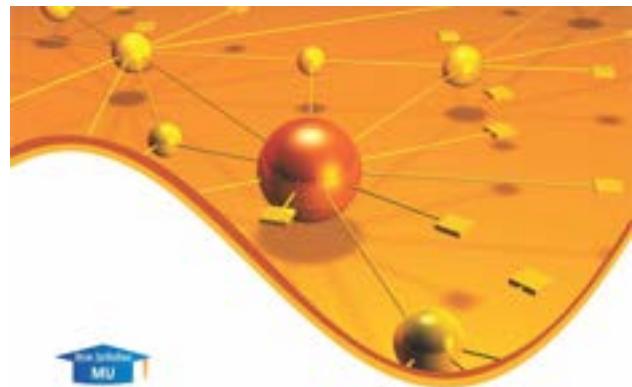
Atlas Supervisor

The Atlas Supervisor was the program which managed the allocation of processing resources of Manchester University's Atlas Computer so that the machine was able to act on many tasks and user programs concurrently.



Automata theory

Automata theory is the study of abstract machines and automata, as well as the computational problems that can be solved using them. It is a theory in theoretical computer science. The word automata comes from the Greek word ?????????, which means "self-acting, self-willed, self-moving". An automaton (automata in plural) is an abstract self-propelled computing device which follows a predetermined sequence of operations automatically. An automaton with a finite number of states is called a Finite Automaton (FA) or Finite-State Machine (FSM). The figure on the right illustrates a finite-state machine, which is a well-known type of automaton. This automaton consists of states (represented in the figure by circles) and transitions (represented by arrows). As the automaton sees a symbol of input, it makes a transition (or jump) to another state, according to its transition function, which takes the previous state and current input symbol as its arguments.



Strictly as per the New Revised Syllabus (REF- 2019 'C' Scheme) of Mumbai University
Sem.I academic year 2020-21 (As per Choice Based Credit and Grading System)

Automata Theory

(Code : ITC404)

Semester IV - Information Technology

Includes:
• Solved Last Year Question Papers

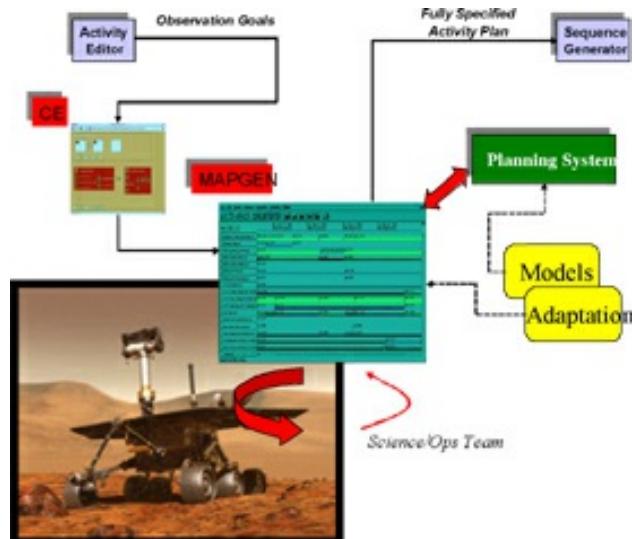
Dilip Kumar Sultania



Automated planning and scheduling

Automated planning and scheduling, sometimes denoted as simply AI planning, is a branch of artificial intelligence that concerns the realization of strategies or action sequences, typically for execution by intelligent agents, autonomous robots and unmanned vehicles. Unlike classical control and classification problems, the solutions are complex and must be discovered and optimized in multidimensional space.

Planning is also related to decision theory.



B (programming language)

B is a programming language developed at Bell Labs circa 1969 by Ken Thompson and Dennis Ritchie.

B (programming language)



B5000

The Burroughs Large Systems Group produced a family of large 48-bit mainframes using stack machine instruction sets with dense syllables. The first machine in the family was the B5000 in 1961. It was optimized for compiling ALGOL 60 programs extremely well, using single-pass compilers. It evolved into the B5500. Subsequent major redesigns include the B6500/B6700 line and its successors, as well as the separate B8500 line.



BASIC

BASIC (Beginners' All-purpose Symbolic Instruction Code) is a family of general-purpose, high-level programming languages designed for ease of use. The original version was created by John G. Kemeny and Thomas E. Kurtz at Dartmouth College in 1963. They wanted to enable students in non-scientific fields to use computers. At the time, nearly all computers required writing custom software, which only scientists and mathematicians tended to learn.

```
1050 REM FOR Z=DLSTART TO DLEND
1050 REM PRINT I,PEEK C12
1070 REM NEXT I
1080 REM
1090 POKE 512,0
1100 POKE 513,0
1110 REM
1120 FOR I=1536 TO 1550
1130 READ A
1140 POKE I,A
1150 NEXT I
1160 REM
1170 FOR I=DLSTART+6 TO DLSTART+20
1180 POKE I,130
1190 NEXT I
1240 POKE 54286,192
2000 REM
2010 DATA 72
2020 DATA 173,11,212,141,10,212,141,24,2
00,141,26,200
2030 DATA 104,64
READY
```

BCPL

BCPL ("Basic Combined Programming Language") is a procedural, imperative, and structured programming language. Originally intended for writing compilers for other languages, BCPL is no longer in common use. However, its influence is still felt because a stripped down and syntactically changed version of BCPL, called B, was the language on which the C programming language was based. BCPL introduced several features of many modern programming languages, including using curly braces to delimit code blocks. BCPL was first implemented by Martin Richards of the University of Cambridge in 1967.



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BOS/360

Basic Operating System/360 (BOS/360) was an early IBM System/360 operating system.

EXPERIENCE
360°

Backward compatible

Backward compatibility (sometimes known as backwards compatibility) is a property of an operating system, product, or technology that allows for interoperability with an older legacy system, or with input designed for such a system, especially in telecommunications and computing.



Barbara J. Grosz

Barbara J. Grosz FRS (Philadelphia, July 21, 1948) is an American computer scientist and Higgins Professor of Natural Sciences at Harvard University. She has made seminal contributions to the fields of natural language processing and multi-agent systems. With Alison Simmons, she is co-founder of the Embedded EthICS programme at Harvard, which embeds ethics lessons into computer science courses.



BareMetal

BareMetal is an exokernel-based single address space operating system (OS) created by Return Infinity.



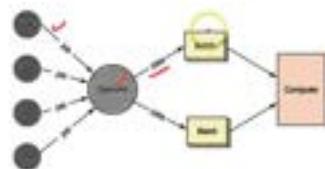
Bash (Unix shell)

Bash is a Unix shell and command language written by Brian Fox for the GNU Project as a free software replacement for the Bourne shell. First released in 1989, it has been used as the default login shell for most Linux distributions. Bash was one of the first programs Linus Torvalds ported to Linux, alongside GCC. A version is also available for Windows 10 and Windows 11 via the Windows Subsystem for Linux. It is also the default user shell in Solaris 11. Bash was also the default shell in versions of Apple macOS from 10.3 (originally, the default shell was tcsh) to 10.15 (macOS Catalina), which changed the default shell to zsh, although Bash remains available as an alternative shell. Bash is a command processor that typically runs in a text window where the user types commands that cause actions. Bash can also read and execute commands from a file, called a shell script. Like most Unix shells, it supports filename globbing (wildcard matching), piping, here documents, command substitution, variables, and control structures for condition-testing and iteration. The keywords, syntax, dynamically scoped variables and other basic features of the language are all copied from sh. Other features, e.g., history, are copied from csh and ksh. Bash is a POSIX-compliant shell, but with a number of extensions.

Batch processing

Computerized batch processing is a method of running software programs called jobs in batches automatically. While users are required to submit the jobs, no other interaction by the user is required to process the batch. Batches may automatically be run at scheduled times as well as being run contingent on the availability of computer resources.

What is a batch system?



Old times: Jobs are submitted in batches to a computer for processing.

BeOS

BeOS is an operating system for personal computers first developed by Be Inc. in 1990. It was first written to run on BeBox hardware.



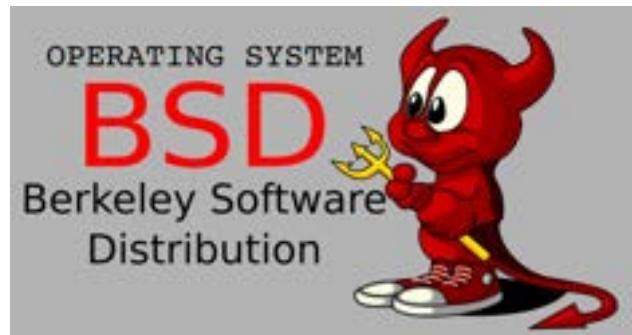
Bell Labs

Nokia Bell Labs, originally named Bell Telephone Laboratories (1925?1984),



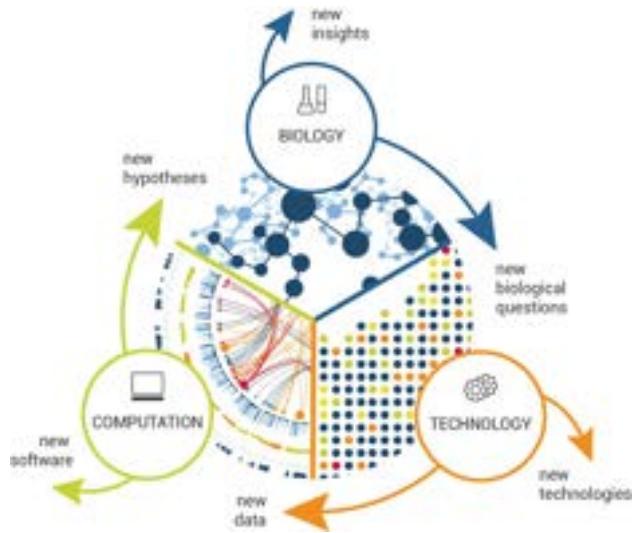
Berkeley Software Distribution

The Berkeley Software Distribution or Berkeley Standard Distribution (BSD) is a discontinued operating system based on Research Unix, developed and distributed by the Computer Systems Research Group (CSRG) at the University of California, Berkeley. The term "BSD" commonly refers to its open-source descendants, including FreeBSD, OpenBSD, NetBSD, and DragonFly BSD.



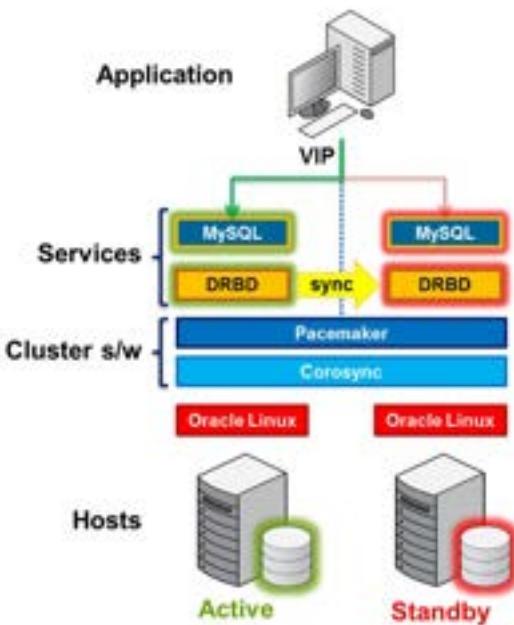
Biological system

A biological system is a complex network which connects several biologically relevant entities. Biological organization spans several scales and are determined based different structures depending on what the system is. Examples of biological systems at the macro scale are populations of organisms. On the organ and tissue scale in mammals and other animals, examples include the circulatory system, the respiratory system, and the nervous system. On the micro to the nanoscopic scale, examples of biological systems are cells, organelles, macromolecular complexes and regulatory pathways. A biological system is not to be confused with a living system, such as a living organism.



Block device

In Unix-like operating systems, a device file or special file is an interface to a device driver that appears in a file system as if it were an ordinary file. There are also special files in DOS, OS/2, and Windows. These special files allow an application program to interact with a device by using its device driver via standard input/output system calls. Using standard system calls simplifies many programming tasks, and leads to consistent user-space I/O mechanisms regardless of device features and functions.



Booting

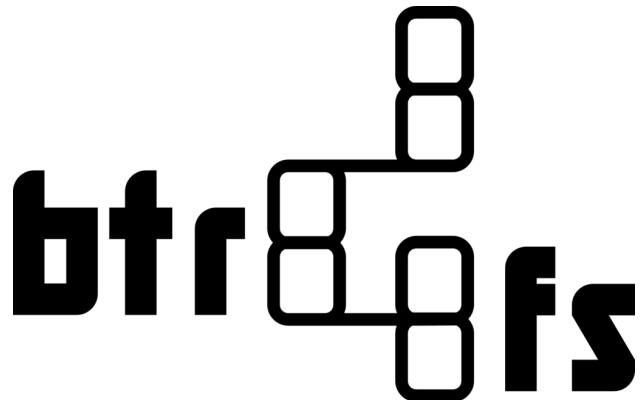
In computing, booting is the process of starting a computer as initiated via hardware such as a button or by a software command. After it is switched on, a computer's central processing unit (CPU) has no software in its main memory, so some process must load software into memory before it can be executed. This may be done by hardware or firmware in the CPU, or by a separate processor in the computer system.



Btrfs

Btrfs (pronounced as "better F S", "butter F S", "b-tree F S", or simply by spelling it out) is a computer storage format that combines a file system based on the copy-on-write (COW) principle with a logical volume manager (not to be confused with Linux's LVM), developed together. It was initially designed at Oracle Corporation in 2007 for use in Linux, and since November 2013, the file system's on-disk format has been declared stable in the Linux kernel.

According to Oracle, Btrfs "is not a true acronym". Btrfs is intended to address the lack of pooling, snapshots, checksums, and integral multi-device spanning in Linux file systems. Chris Mason, the principal Btrfs author, stated that its goal was "to let [Linux] scale for the storage that will be available. Scaling is not just about addressing the storage but also means being able to administer and to manage it with a clean interface that lets people see what's being used and makes it more reliable".



Burroughs Corporation

The Burroughs Corporation was a major American manufacturer of business equipment. The company was founded in 1886 as the American Arithmometer Company. In 1986, it merged with Sperry UNIVAC to form Unisys. The company's history paralleled many of the major developments in computing. At its start, it produced mechanical adding machines, and later moved into programmable ledgers and then computers. It was one of the largest producers of mainframe computers in the world, also producing related equipment including typewriters and printers.



Burroughs MCP

The MCP (Master Control Program) is the operating system of the Burroughs small, medium and large systems, including the Unisys Clearpath/MCP systems.



Burroughs large systems

The Burroughs Large Systems Group produced a family of large 48-bit mainframes using stack machine instruction sets with dense syllables. The first machine in the family was the B5000 in 1961. It was optimized for compiling ALGOL 60 programs extremely well, using single-pass compilers. It evolved into the B5500. Subsequent major redesigns include the B6500/B6700 line and its successors, as well as the separate B8500 line.

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Bus error

In computing, a bus error is a fault raised by hardware, notifying an operating system (OS) that a process is trying to access memory that the CPU cannot physically address: an invalid address for the address bus, hence the name. In modern use on most architectures these are much rarer than segmentation faults, which occur primarily due to memory access violations: problems in the logical address or permissions.



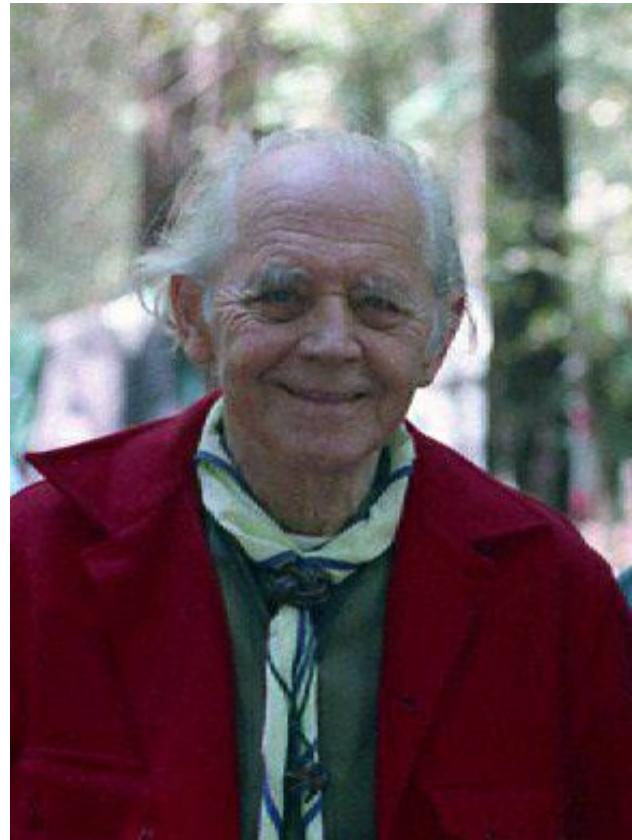
Busy waiting

In computer science and software engineering, busy-waiting, busy-looping or spinning is a technique in which a process repeatedly checks to see if a condition is true, such as whether keyboard input or a lock is available. Spinning can also be used to generate an arbitrary time delay, a technique that was necessary on systems that lacked a method of waiting a specific length of time. Processor speeds vary greatly from computer to computer, especially as some processors are designed to dynamically adjust speed based on current workload. Consequently, spinning as a time-delay technique can produce unpredictable or even inconsistent results on different systems unless code is included to determine the time a processor takes to execute a "do nothing" loop, or the looping code explicitly checks a real-time clock.



Béla H. Bonathy

Béla Heinrich Bonathy (Hungarian: Bénonáthy Béla; December 1, 1919 – September 4, 2003) was a Hungarian-American linguist, and Professor at San Jose State University and UC Berkeley. He is known as founder of the White Stag Leadership Development Program, established the International Systems Institute in 1982, and was co-founder of the General Evolutionary Research Group in 1984. He grew up in largely rural Hungary and served in the Hungarian military during World War II. When Russia invaded Hungary in April 1945, he and his family fled to Allied-occupied Austria and lived in a displaced persons camp for six years. In 1951, they emigrated to Chicago, sponsored by the Presbyterian church. Within the year his former commanding officer suggested to the U.S. government that they hire Bonathy as a Hungarian instructor at the Army Language School in Monterey, California. While living in Monterey, he founded the White Stag Leadership Development Program.



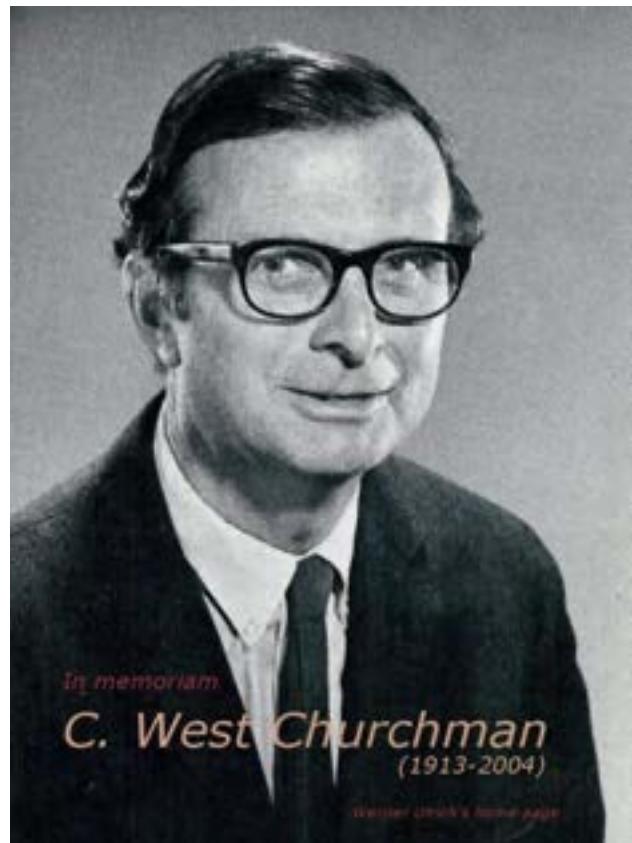
C (programming language)

C (pronounced ? like the letter c) is a general-purpose computer programming language. It was created in the 1970s by Dennis Ritchie, and remains very widely used and influential. By design, C's features cleanly reflect the capabilities of the targeted CPUs. It has found lasting use in operating systems, device drivers, protocol stacks, though decreasingly for application software. C is commonly used on computer architectures that range from the largest supercomputers to the smallest microcontrollers and embedded systems.



C. West Churchman

Charles West Churchman (29 August 1913 – 21 March 2004) was an American philosopher and systems scientist, who was Professor at the School of Business Administration and Professor of Peace and Conflict Studies at the University of California, Berkeley. He was internationally known for his pioneering work in operations research, system analysis and ethics.



CDC Kronos

Kronos is an operating system with time-sharing capabilities, written by Control Data Corporation in the 1970s. Kronos ran on the 60-bit CDC 6000 series mainframe computers and their successors. CDC replaced Kronos with the NOS operating system in the late 1970s, which were succeeded by the NOS/VE operating system in the mid-1980s. The MACE operating system and APEX were forerunners to KRONOS. It was written by Control Data systems programmer Greg Mansfield, Dave Cahlander, Bob Tate and three others.



CERN httpd

CERN httpd (later also known as W3C httpd) is an early, now discontinued, web server (HTTP) daemon originally developed at CERN from 1990 onwards by Tim Berners-Lee, Ari Luotonen and Henrik Frystyk Nielsen. Implemented in C, it was the first web server software.



CP-67

CP-67 was the control program portion of CP/CMS, a virtual machine operating system developed for the IBM System/360-67 by IBM's Cambridge Scientific Center. It was a reimplementation of their earlier research system CP-40, which ran on a one-off customized S/360-40. CP-67 was later reimplemented (again) as CP-370, which IBM released as VM/370 in 1972, when virtual memory was added to the System/370 series. Details on the development and circumstances of CP-67 can be found in the article History of CP/CMS.



CP/M

CP/M, originally standing for Control Program/Monitor and later Control Program for Microcomputers, is a mass-market operating system created in 1974 for Intel 8080/85-based microcomputers by Gary Kildall of Digital Research, Inc. Initially confined to single-tasking on 8-bit processors and no more than 64 kilobytes of memory, later versions of CP/M added multi-user variations and were migrated to 16-bit processors.



Call stack

In computer science, a call stack is a stack data structure that stores information about the active subroutines of a computer program. This kind of stack is also known as an execution stack, program stack, control stack, run-time stack, or machine stack, and is often shortened to just "the stack". Although maintenance of the call stack is important for the proper functioning of most software, the details are normally hidden and automatic in high-level programming languages. Many computer instruction sets provide special instructions for manipulating stacks.

Case sensitivity

In computers, case sensitivity defines whether uppercase and lowercase letters are treated as distinct (case-sensitive) or equivalent (case-insensitive). For instance, when users interested in learning about dogs search an e-book, "dog" and "Dog" are of the same significance to them. Thus, they request a case-insensitive search. But when they search an online encyclopedia for information about the United Nations, for example, or something with no ambiguity regarding capitalization and ambiguity between two or more terms cut down by capitalization, they may prefer a case-sensitive search.



Central processing unit

A central processing unit (CPU), also called a central processor or main processor, is the most important processor in a given computer. Its electronic circuitry executes instructions of a computer program, such as arithmetic, logic, controlling, and input/output (I/O) operations. This role contrasts with that of external components, such as main memory and I/O circuitry, and specialized coprocessors such as graphics processing units (GPUs).



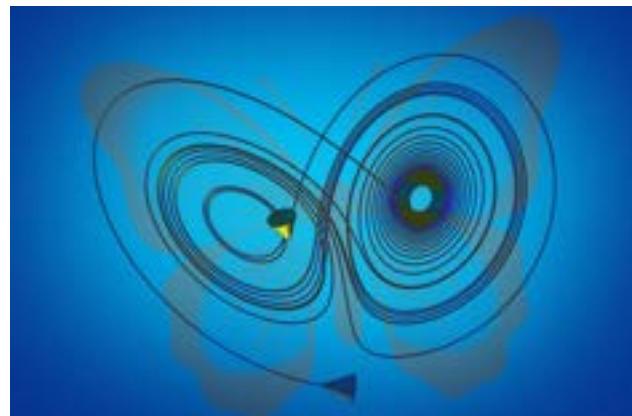
Channel I/O

In computing, channel I/O is a high-performance input/output (I/O) architecture that is implemented in various forms on a number of computer architectures, especially on mainframe computers. In the past, channels were generally implemented with custom devices, variously named channel, I/O processor, I/O controller, I/O synchronizer, or DMA controller.



Chaos theory

Chaos theory is an interdisciplinary area of scientific study and branch of mathematics focused on underlying patterns and deterministic laws of dynamical systems that are highly sensitive to initial conditions, and were once thought to have completely random states of disorder and irregularities. Chaos theory states that within the apparent randomness of chaotic complex systems, there are underlying patterns, interconnection, constant feedback loops, repetition, self-similarity, fractals, and self-organization. The butterfly effect, an underlying principle of chaos, describes how a small change in one state of a deterministic nonlinear system can result in large differences in a later state (meaning that there is sensitive dependence on initial conditions). A metaphor for this behavior is that a butterfly flapping its wings in Brazil can cause a tornado in Texas. Small differences in initial conditions, such as those due to errors in measurements or due to rounding errors in numerical computation, can yield widely diverging outcomes for such dynamical systems, rendering long-term prediction of their behavior impossible in general. This can happen even though these systems are deterministic, meaning that their future behavior follows a unique evolution and is fully determined by their initial conditions, with no random elements involved. In other words, the deterministic nature of these systems does not make them predictable. This behavior is known as deterministic chaos, or simply chaos. The theory was summarized by Edward Lorenz as:



Charles A. S. Hall

Charles A. S. Hall (born 1943) is an American systems ecologist and ESF Foundation Distinguished Professor at State University of New York in the College of Environmental Science & Forestry.



ChromeOS

ChromeOS, sometimes styled as chromeOS and formerly styled as Chrome OS, is a Linux-based operating system developed and designed by Google. It is derived from the open-source ChromiumOS and uses the Google Chrome web browser as its principal user interface.



ChromiumOS

ChromiumOS (formerly styled as Chromium OS) is a free and open-source operating system designed for running web applications and browsing the World Wide Web. It is the open-source version of ChromeOS, a Linux-based operating system made by Google.



Classic Mac OS

Mac OS (originally System Software; retronym: Classic Mac OS) is the series of operating systems developed for the Macintosh family of personal computers by Apple Computer from 1984 to 2001, starting with System 1 and ending with Mac OS 9. The Macintosh operating system is credited with having popularized the graphical user interface concept. It was included with every Macintosh that was sold during the era in which it was developed, and many updates to the system software were done in conjunction with the introduction of new Macintosh systems.



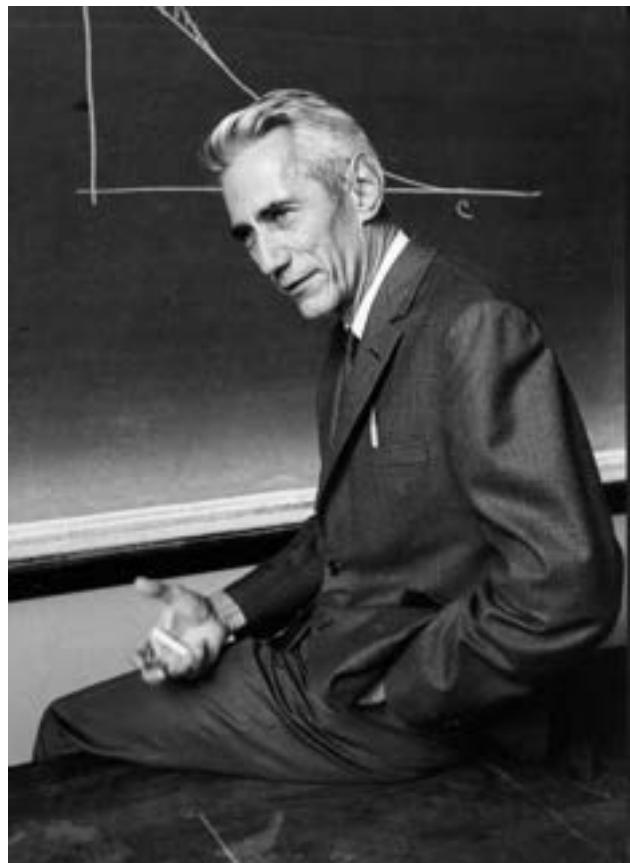
Classified information

Classified information is material that a government body deems to be sensitive information that must be protected. Access is restricted by law or regulation to particular groups of people with the necessary security clearance and need to know, and mishandling of the material can incur criminal penalties.



Claude Shannon

Claude Elwood Shannon (April 30, 1916 – February 24, 2001) was an American mathematician, electrical engineer, and cryptographer known as a "father of information theory". As a 21-year-old master's degree student at the Massachusetts Institute of Technology (MIT), he wrote his thesis demonstrating that electrical applications of Boolean algebra could construct any logical numerical relationship. Shannon contributed to the field of cryptanalysis for national defense of the United States during World War II, including his fundamental work on codebreaking and secure telecommunications.



Command-line interface

A command-line interpreter or command-line processor uses a command-line interface (CLI) to receive commands from a user in the form of lines of text. This provides a means of setting parameters for the environment, invoking executables and providing information to them as to what actions they are to perform. In some cases the invocation is conditional based on conditions established by the user or previous executables. Such access was first provided by computer terminals starting in the mid-1960s. This provided an interactive environment not available with punched cards or other input methods.



Common Desktop Environment

The Common Desktop Environment (CDE) is a desktop environment for Unix and OpenVMS, based on the Motif widget toolkit. It was part of the UNIX 98 Workstation Product Standard, and was for a long time the Unix desktop associated with commercial Unix workstations. It helped to influence early implementations of successor projects such as KDE and GNOME desktop environment, which largely replaced CDE following the turn of the century.



Common Open Software Environment

The Common Open Software Environment (COSE) was an initiative formed in March 1993 by the major Unix vendors of the time to create open, unified operating system (OS) standards.



Compact disc

The compact disc (CD) is a digital optical disc data storage format that was co-developed by Philips and Sony to store and play digital audio recordings. In August 1982, the first compact disc was manufactured. It was then released in October 1982 in Japan and branded as Digital Audio Compact Disc.



Comparison of operating systems

These tables provide a comparison of operating systems, of computer devices, as listing general and technical information for a number of widely used and currently available PC or handheld (including smartphone and tablet computer) operating systems. The article "Usage share of operating systems" provides a broader, and more general, comparison of operating systems that includes servers, mainframes and supercomputers.

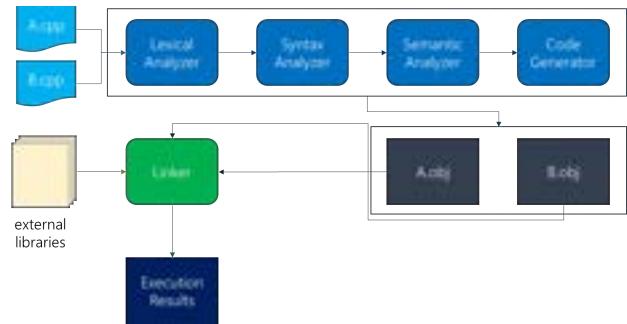
Comparison of user features of operating systems

Comparison of user features of operating systems refers to a comparison of the general user features of major operating systems in a narrative format. It does not encompass a full exhaustive comparison or description of all technical details of all operating systems. It is a comparison of basic roles and the most prominent features. It also includes the most important features of the operating system's origins, historical development, and role.

Mobile operating system	Apple iOS	Google Android	ARM BlackBerry	Microsoft Windows Phone
Device Manufacturer	Apple	OEMs	RIM	OEMs
Latest iOS version*	iOS 6	Android 4.2	BlackBerry 10	Windows Phone 8
Recently Managed Under OS Version	iOS 4.3	Android 2.3.5	Many	Windows Phone 7.5, Windows Mobile 6.5
Remote Administration interface and Method	Native agent uses iOS MDM protocol	Third-party agents use Android Device Admin API	Native agent uses BES protocol	Native agent uses EAS protocol
Native MDM Products	None	None	BlackBerry Enterprise Server, BlackBerry Mobile Fusion	Exchange Server, Office 365, System Center, Windows Intune
Third Party MDM Products	Many	Many	Limited	Many for Windows Mobile; limited for Windows Phone
Single-OS Management	No	No	Yes	Yes
Multi-OS Management	Yes	Yes	Yes, via BES Pass-Through	No
EAS Management	Yes	Yes	No	Yes

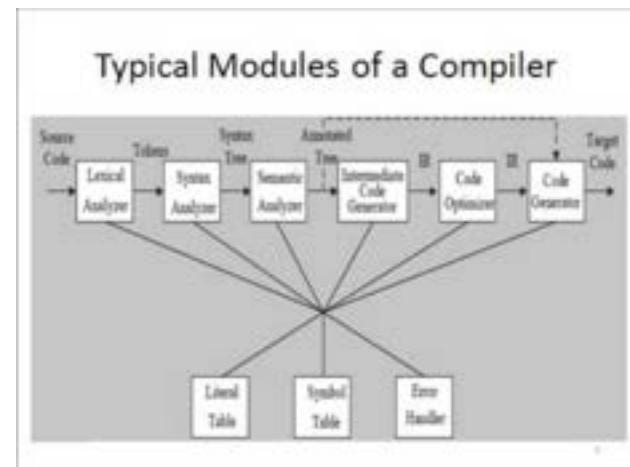
Compiler

In computing, a compiler is a computer program that translates computer code written in one programming language (the source language) into another language (the target language). The name "compiler" is primarily used for programs that translate source code from a high-level programming language to a low-level programming language (e.g. assembly language, object code, or machine code) to create an executable program.:?p1?There are many different types of compilers which produce output in different useful forms. A cross-compiler produces code for a different CPU or operating system than the one on which the cross-compiler itself runs. A bootstrap compiler is often a temporary compiler, used for compiling a more permanent or better optimised compiler for a language.



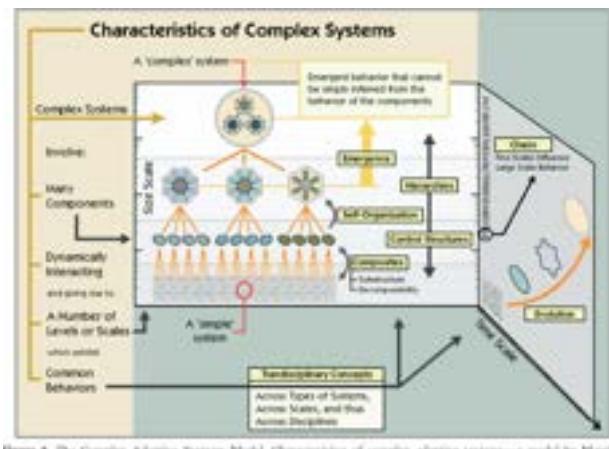
Compiler construction

In computing, a compiler is a computer program that translates computer code written in one programming language (the source language) into another language (the target language). The name "compiler" is primarily used for programs that translate source code from a high-level programming language to a low-level programming language (e.g. assembly language, object code, or machine code) to create an executable program.:?p1?There are many different types of compilers which produce output in different useful forms. A cross-compiler produces code for a different CPU or operating system than the one on which the cross-compiler itself runs. A bootstrap compiler is often a temporary compiler, used for compiling a more permanent or better optimised compiler for a language.



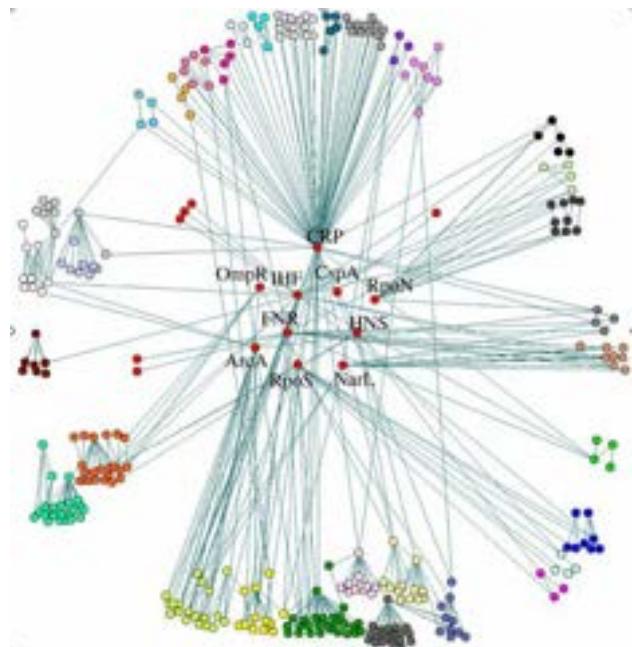
Complex adaptive system

A complex adaptive system is a system that is complex in that it is a dynamic network of interactions, but the behavior of the ensemble may not be predictable according to the behavior of the components. It is adaptive in that the individual and collective behavior mutate and self-organize corresponding to the change-initiating micro-event or collection of events. It is a "complex macroscopic collection" of relatively "similar and partially connected micro-structures" formed in order to adapt to the changing environment and increase their survivability as a macro-structure. The Complex Adaptive Systems approach builds on replicator dynamics. The study of complex adaptive systems, a subset of nonlinear dynamical systems, is an interdisciplinary matter that attempts to blend insights from the natural and social sciences to develop system-level models and insights that allow for heterogeneous agents, phase transition, and emergent behavior.



Complex system

A complex system is a system composed of many components which may interact with each other. Examples of complex systems are Earth's global climate, organisms, the human brain, infrastructure such as power grid, transportation or communication systems, complex software and electronic systems, social and economic organizations (like cities), an ecosystem, a living cell, and ultimately the entire universe.



Complex systems

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Computability theory

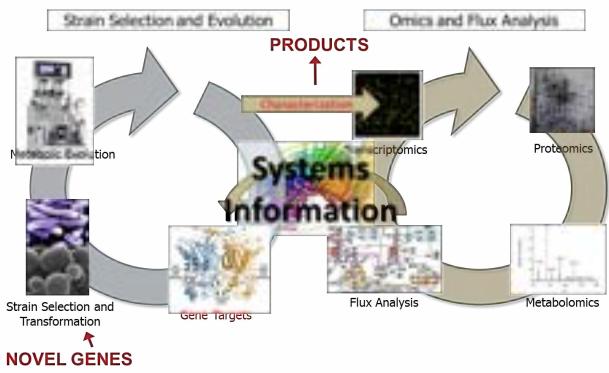
Computability theory, also known as recursion theory, is a branch of mathematical logic, computer science, and the theory of computation that originated in the 1930s with the study of computable functions and Turing degrees. The field has since expanded to include the study of generalized computability and definability. In these areas, computability theory overlaps with proof theory and effective descriptive set theory.

Computability theory

Computational biology

Computational biology refers to the use of data analysis, mathematical modeling and computational simulations to understand biological systems and relationships. An intersection of computer science, biology, and big data, the field also has foundations in applied mathematics, chemistry, and genetics. It differs from biological computing, a subfield of computer engineering which uses bioengineering to build computers.

Role of Computational Biology Microbial Metabolic Engineering Design Engine



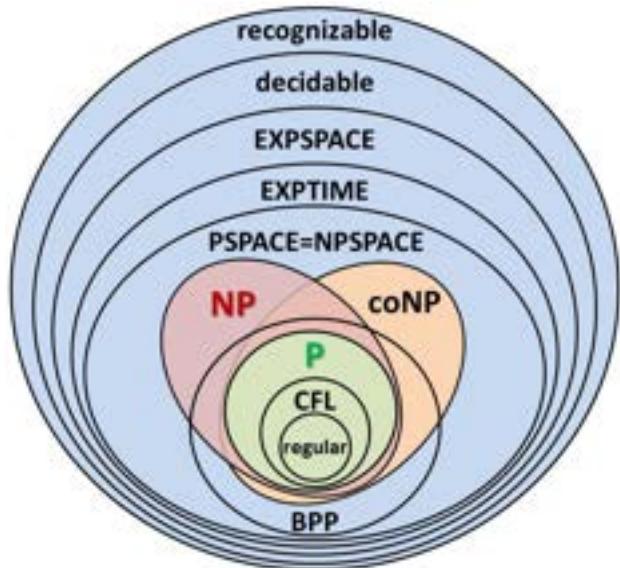
Computational chemistry

Computational chemistry is a branch of chemistry that uses computer simulation to assist in solving chemical problems. It uses methods of theoretical chemistry, incorporated into computer programs, to calculate the structures and properties of molecules, groups of molecules, and solids. It is essential because, apart from relatively recent results concerning the hydrogen molecular ion (dihydrogen cation, see references therein for more details), the quantum many-body problem cannot be solved analytically, much less in closed form. While computational results normally complement the information obtained by chemical experiments, it can in some cases predict hitherto unobserved chemical phenomena. It is widely used in the design of new drugs and materials.



Computational complexity theory

In theoretical computer science and mathematics, computational complexity theory focuses on classifying computational problems according to their resource usage, and relating these classes to each other. A computational problem is a task solved by a computer. A computation problem is solvable by mechanical application of mathematical steps, such as an algorithm.



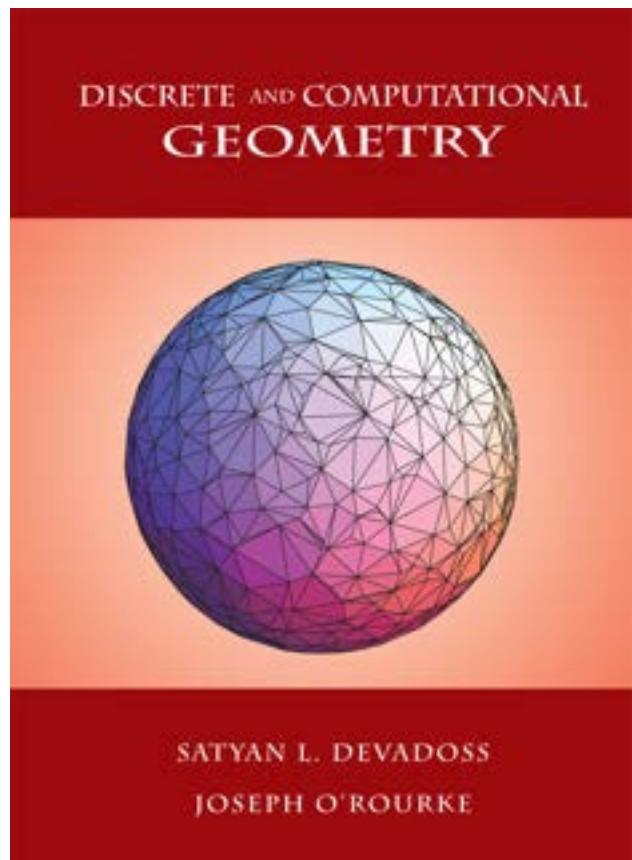
Computational engineering

Computational Engineering is a relatively new discipline that deals with the development and application of computational models for engineering. As an emerging field, there is still some ambiguity as to what constitutes Computational Engineering. Some see it as a mostly simulation-driven approach to engineering challenges. Others see it as a way to use computer algorithms to mimic the way engineers work, sometimes coupled with some aspect of AI.



Computational geometry

Computational geometry is a branch of computer science devoted to the study of algorithms which can be stated in terms of geometry. Some purely geometrical problems arise out of the study of computational geometric algorithms, and such problems are also considered to be part of computational geometry. While modern computational geometry is a recent development, it is one of the oldest fields of computing with a history stretching back to antiquity.



Computational mathematics

Computational mathematics is an area of mathematics devoted to the interaction between mathematics and computer computation. A large part of computational mathematics consists roughly of using mathematics for allowing and improving computer computation in areas of science and engineering where mathematics are useful. This involves in particular algorithm design, computational complexity, numerical methods and computer algebra.



Computational physics

Computational physics is the study and implementation of numerical analysis to solve problems in physics for which a quantitative theory already exists.

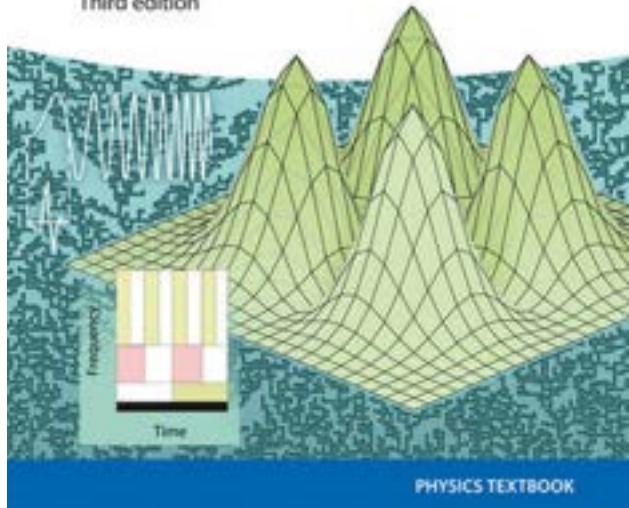
Historically, computational physics was the first application of modern computers in science, and is now a subset of computational science. It is sometimes regarded as a subdiscipline (or offshoot) of theoretical physics, but others consider it an intermediate branch between theoretical and experimental physics - an area of study which supplements both theory and experiment.

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Rubin H. Landau, Manuel J. Páez
and Cristian C. Bordeianu

Computational Physics

Problem Solving with Python
Third edition



Computational social science

Computational social science is the academic sub-discipline concerned with computational approaches to the social sciences. This means that computers are used to model, simulate, and analyze social phenomena. Fields include computational economics, computational sociology, cliodynamics, culturomics, and the automated analysis of contents, in social and traditional media. It focuses on investigating social and behavioral relationships and interactions through social simulation, modeling, network analysis, and media analysis.



Computer accessibility

Computer accessibility (also known as accessible computing) refers to the accessibility of a computer system to all people, regardless of disability type or severity of impairment. The term accessibility is most often used in reference to specialized hardware or software, or a combination of both, designed to enable the use of a computer by a person with a disability or impairment. Computer accessibility often has direct positive effects on people with disabilities.



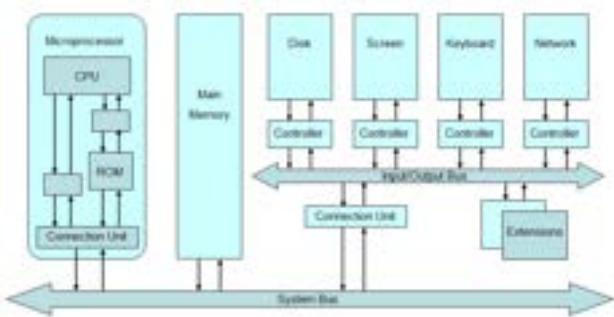
Computer animation

Computer animation is the process used for digitally generating animations. The more general term computer-generated imagery (CGI) encompasses both static scenes (still images) and dynamic images (moving images), while computer animation only refers to moving images. Modern computer animation usually uses 3D computer graphics to generate a three-dimensional picture. The target of the animation is sometimes the computer itself, while other times it is film.



Computer architecture

In computer engineering, computer architecture is a description of the structure of a computer system made from component parts. It can sometimes be a high-level description that ignores details of the implementation. At a more detailed level, the description may include the instruction set architecture design, microarchitecture design, logic design, and implementation.



Computer data storage

Computer data storage is a technology consisting of computer components and recording media that are used to retain digital data. It is a core function and fundamental component of computers.¹⁵¹⁶The central processing unit (CPU) of a computer is what manipulates data by performing computations. In practice, almost all computers use a storage hierarchy,¹⁷ which puts fast but expensive and small storage options close to the CPU and slower but less expensive and larger options further away. Generally, the fast technologies are referred to as "memory", while slower persistent technologies are referred to as "storage".



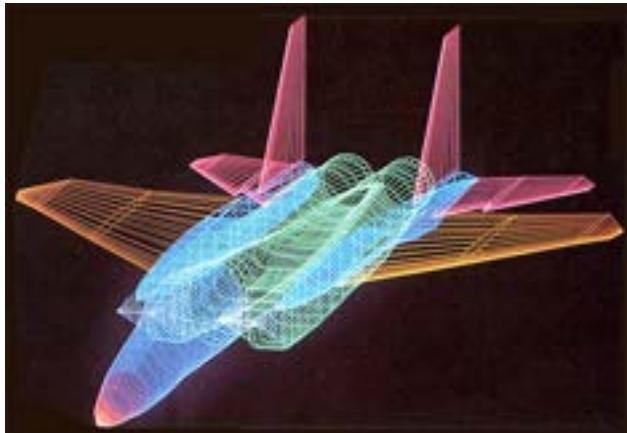
Computer file

A computer file is a computer resource for recording data in a computer storage device, primarily identified by its file name. Just as words can be written to paper, so can data be written to a computer file. Files can be shared with and transferred between computers and mobile devices via removable media, networks, or the Internet.



Computer graphics

Computer graphics deals with generating images and art with the aid of computers. Today, computer graphics is a core technology in digital photography, film, video games, digital art, cell phone and computer displays, and many specialized applications. A great deal of specialized hardware and software has been developed, with the displays of most devices being driven by computer graphics hardware. It is a vast and recently developed area of computer science. The phrase was coined in 1960 by computer graphics researchers Verne Hudson and William Fetter of Boeing. It is often abbreviated as CG, or typically in the context of film as computer generated imagery (CGI). The non-artistic aspects of computer graphics are the subject of computer science research. Some topics in computer graphics include user interface design, sprite graphics, rendering, ray tracing, geometry processing, computer animation, vector graphics, 3D modeling, shaders, GPU design, implicit surfaces, visualization, scientific computing, image processing, computational photography, scientific visualization, computational geometry and computer vision, among others. The overall methodology depends heavily on the underlying sciences of geometry, optics, physics, and perception.



Computer hardware

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), random access memory (RAM), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard. By contrast, software is the set of instructions that can be stored and run by hardware. Hardware is so-termed because it is "hard" or rigid with respect to changes, whereas software is "soft" because it is easy to change.



Computer monitor

A computer monitor is an output device that displays information in pictorial or textual form. A discrete monitor comprises a visual display, support electronics, power supply, housing, electrical connectors, and external user controls.



Computer mouse

A computer mouse (plural mice, also mouses) is a hand-held pointing device that detects two-dimensional motion relative to a surface. This motion is typically translated into the motion of a pointer on a display, which allows a smooth control of the graphical user interface of a computer.



Computer multitasking

In computing, multitasking is the concurrent execution of multiple tasks (also known as processes) over a certain period of time. New tasks can interrupt already started ones before they finish, instead of waiting for them to end. As a result, a computer executes segments of multiple tasks in an interleaved manner, while the tasks share common processing resources such as central processing units (CPUs) and main memory. Multitasking automatically interrupts the running program, saving its state (partial results, memory contents and computer register contents) and loading the saved state of another program and transferring control to it. This "context switch" may be initiated at fixed time intervals (pre-emptive multitasking), or the running program may be coded to signal to the supervisory software when it can be interrupted (cooperative multitasking).



Computer network

A computer network is a set of computers sharing resources located on or provided by network nodes. The computers use common communication protocols over digital interconnections to communicate with each other. These interconnections are made up of telecommunication network technologies, based on physically wired, optical, and wireless radio-frequency methods that may be arranged in a variety of network topologies.



Computer program

A computer program is a sequence or set of instructions in a programming language for a computer to execute. Computer programs are one component of software, which also includes documentation and other intangible components. A computer program in its human-readable form is called source code. Source code needs another computer program to execute because computers can only execute their native machine instructions. Therefore, source code may be translated to machine instructions using the language's compiler. (Assembly language programs are translated using an assembler.) The resulting file is called an executable. Alternatively, source code may execute within the language's interpreter. If the executable is requested for execution, then the operating system loads it into memory and starts a process. The central processing unit will soon switch to this process so it can fetch, decode, and then execute each machine instruction. If the source code is requested for execution, then the operating system loads the corresponding interpreter into memory and starts a process. The interpreter then loads the source code into memory to translate and execute each statement. Running the source code is slower than running an executable. Moreover, the interpreter must be installed on the computer.



Computer science

Computer science is the study of computation, automation, and information. Computer science spans theoretical disciplines (such as algorithms, theory of computation, information theory, and automation) to practical disciplines (including the design and implementation of hardware and software). Computer science is generally considered an academic discipline and distinct from computer programming. Algorithms and data structures are central to computer science.



Computer security

Computer security, cybersecurity (cyber security), or information technology security (IT security) is the protection of computer systems and networks from attack by malicious actors that may result in unauthorized information disclosure, theft of, or damage to hardware, software, or data, as well as from the disruption or misdirection of the services they provide. The field has become of significance due to the expanded reliance on computer systems, the Internet, and wireless network standards such as Bluetooth and Wi-Fi, and due to the growth of smart devices, including smartphones, televisions, and the various devices that constitute the Internet of things (IoT). Cybersecurity is one of the most significant challenges of the contemporary world, due to both the complexity of information systems and the societies they support. Security is of especially high importance for systems that govern large-scale systems with far-reaching physical effects, such as power distribution, elections, and finance.

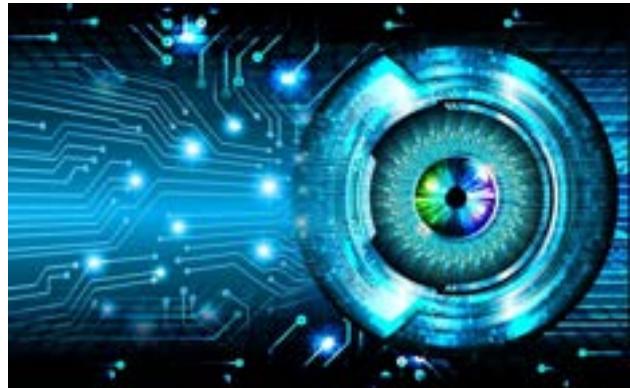


Computer security compromised by hardware failure

Computer security compromised by hardware failure is a branch of computer security applied to hardware.

Computer vision

Computer vision tasks include methods for acquiring, processing, analyzing and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information, e.g. in the forms of decisions. Understanding in this context means the transformation of visual images (the input of the retina) into descriptions of the world that make sense to thought processes and can elicit appropriate action. This image understanding can be seen as the disentangling of symbolic information from image data using models constructed with the aid of geometry, physics, statistics, and learning theory.



Computing platform

A computing platform or digital platform is an environment in which a piece of software is executed. It may be the hardware or the operating system (OS), even a web browser and associated application programming interfaces, or other underlying software, as long as the program code is executed with it. Computing platforms have different abstraction levels, including a computer architecture, an OS, or runtime libraries. A computing platform is the stage on which computer programs can run.



Conceptual system

A conceptual system is a system that is composed of non-physical objects, i.e. ideas or concepts. In this context a system is taken to mean "an interrelated, interworking set of objects".

IPO Model Conceptual Framework of Procurement Management System



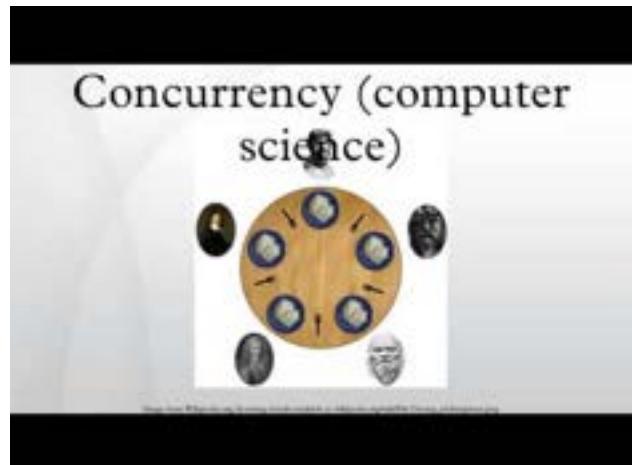
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Services Offered:
- Web Development
- Mobile Development
- System Development
- Corporate Documentation

Concurrency (computer science)

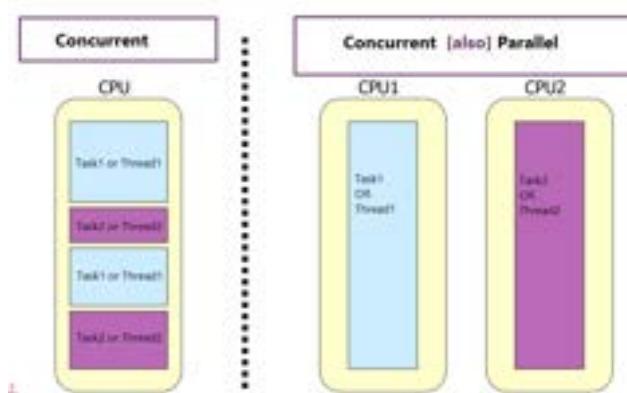
In computer science, concurrency is the ability of different parts or units of a program, algorithm, or problem to be executed out-of-order or in partial order, without affecting the outcome. This allows for parallel execution of the concurrent units, which can significantly improve overall speed of the execution in multi-processor and multi-core systems. In more technical terms, concurrency refers to the decomposability of a program, algorithm, or problem into order-independent or partially-ordered components or units of computation. According to Rob Pike, concurrency is the composition of independently executing computations, and concurrency is not parallelism: concurrency is about dealing with lots of things at once but parallelism is about doing lots of things at once. Concurrency is about structure, parallelism is about execution, concurrency provides a way to structure a solution to solve a problem that may (but not necessarily) be parallelizable. A number of mathematical models have been developed for general concurrent computation including Petri nets, process calculi, the parallel random-access machine model, the actor model and the Reo Coordination Language.



Concurrent computing

Concurrent computing is a form of computing in which several computations are executed concurrently?during overlapping time periods?instead of sequentially?with one completing before the next starts.

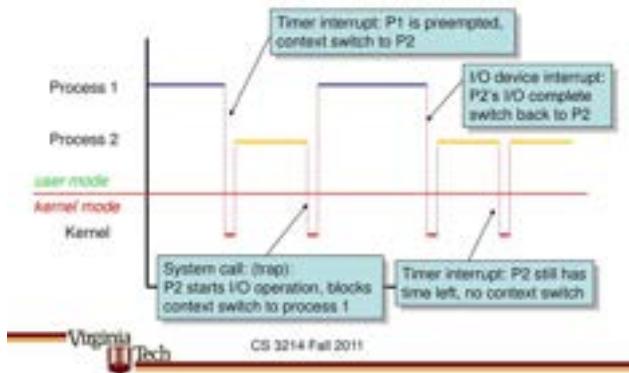
Concurrency & Parallelism



Context switch

In computing, a context switch is the process of storing the state of a process or thread, so that it can be restored and resume execution at a later point, and then restoring a different, previously saved, state. This allows multiple processes to share a single central processing unit (CPU), and is an essential feature of a multitasking operating system. In a traditional CPU, each process - a program in execution - utilizes the various CPU registers to store data and hold the current state of the running process. However, in a multitasking operating system, the operating system switches between processes or threads to allow the execution of multiple processes simultaneously. For every switch, the operating system must save the state of the currently running process, followed by loading the next process state, which will run on the CPU. This sequence of operations that stores the state of the running process and the loading of the following running process is called a context switch.

A Context Switch Scenario



Control Data Corporation

Control Data Corporation (CDC) was a mainframe and supercomputer firm. CDC was one of the nine major United States computer companies through most of the 1960s; the others were IBM, Burroughs Corporation, DEC, NCR, General Electric, Honeywell, RCA, and UNIVAC. CDC was well-known and highly regarded throughout the industry at the time. For most of the 1960s, Seymour Cray worked at CDC and developed a series of machines that were the fastest computers in the world by far, until Cray left the company to found Cray Research (CRI) in the 1970s. After several years of losses in the early 1980s, in 1988 CDC started to leave the computer manufacturing business and sell the related parts of the company, a process that was completed in 1992 with the creation of Control Data Systems, Inc. The remaining businesses of CDC currently operate as Ceridian.

Control Data Corporation



<https://de.wikipedia.org/wiki/Datei:CDC-Logo.svg>

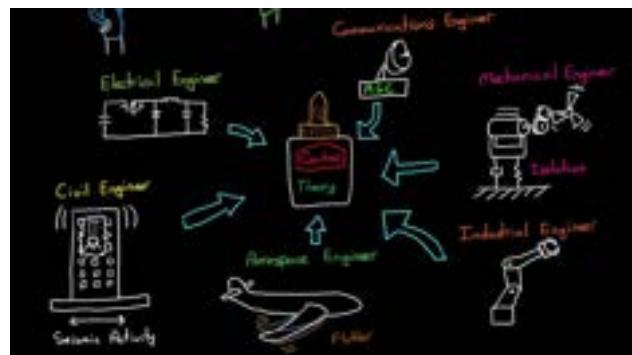
Control flow

In computer science, control flow (or flow of control) is the order in which individual statements, instructions or function calls of an imperative program are executed or evaluated. The emphasis on explicit control flow distinguishes an imperative programming language from a declarative programming language.



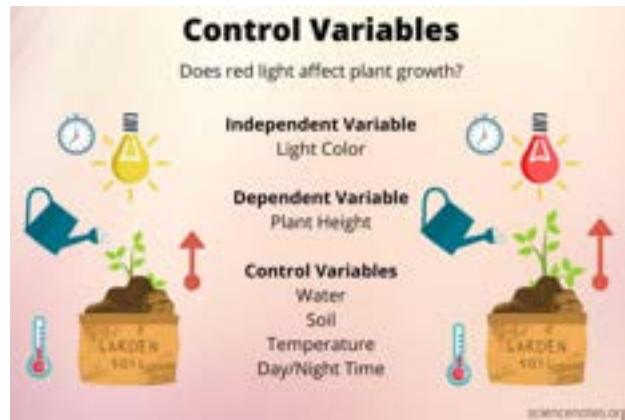
Control theory

Control theory is a field of control engineering and applied mathematics that deals with the control of dynamical systems in engineered processes and machines. The objective is to develop a model or algorithm governing the application of system inputs to drive the system to a desired state, while minimizing any delay, overshoot, or steady-state error and ensuring a level of control stability; often with the aim to achieve a degree of optimality.



Control variable (programming)

In computer science, control flow (or flow of control) is the order in which individual statements, instructions or function calls of an imperative program are executed or evaluated. The emphasis on explicit control flow distinguishes an imperative programming language from a declarative programming language.



Control-C

Control+C is a common computer command. It is generated by pressing the C key while holding down the Ctrl key on most computer keyboards.



Cooperative multitasking

Cooperative multitasking, also known as non-preemptive multitasking, is a style of computer multitasking in which the operating system never initiates a context switch from a running process to another process. Instead, in order to run multiple applications concurrently, processes voluntarily yield control periodically or when idle or logically blocked. This type of multitasking is called cooperative because all programs must cooperate for the scheduling scheme to work.

PREEMPTIVE MULTITASKING VERSUS COOPERATIVE MULTITASKING

PREEMPTIVE MULTITASKING

Task in which a computer operating system uses to decide for how long to execute a task before giving another task to use the operating system

Interrups applications and gives control to other processes outside the application's control

UNIX, Windows 95, Windows NT are some examples for operating systems with preemptive multitasking

COOPERATIVE MULTITASKING

Type of computer multitasking in which the operating system never initiates a context switch from a running process to another process

Process scheduler never interrupts a process unexpectedly

Macintosh OS version 8.0.9.2.2 and Windows 3.x operating systems are based on cooperative multitasking

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Coupled human? environment system

A coupled human?environment system (known also as a coupled human and natural system, or CHANS) characterizes the dynamical two-way interactions between human systems (e.g., economic, social) and natural (e.g., hydrologic, atmospheric, biological, geological) systems. This coupling expresses the idea that the evolution of humans and environmental systems may no longer be treated as individual isolated systems. Some examples of coupled systems can be read here in the section "Socioeconomic Drivers":Environmental factor#Socioeconomic Drivers

Coupled human–environment system



https://en.wikipedia.org/w/index.php?title=Human%E2%80%93environment_system&oldid=9000000

Crash (computing)

In computing, a crash, or system crash, occurs when a computer program such as a software application or an operating system stops functioning properly and exits. On some operating systems or individual applications, a crash reporting service will report the crash and any details relating to it (or give the user the option to do so), usually to the developer(s) of the application. If the program is a critical part of the operating system, the entire system may crash or hang, often resulting in a kernel panic or fatal system error.



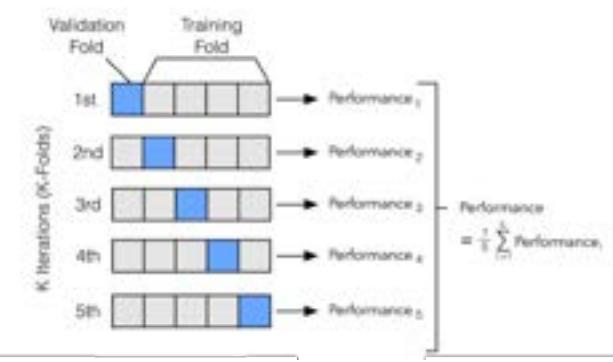
Credit card

A credit card is a payment card issued to users (cardholders) to enable the cardholder to pay a merchant for goods and services based on the cardholder's accrued debt (i.e., promise to the card issuer to pay them for the amounts plus the other agreed charges). The card issuer (usually a bank or credit union) creates a revolving account and grants a line of credit to the cardholder, from which the cardholder can borrow money for payment to a merchant or as a cash advance. There are two credit card groups: consumer credit cards and business credit cards. Most cards are plastic, but some are metal cards (stainless steel, gold, palladium, titanium), and a few gemstone-encrusted metal cards. A regular credit card is different from a charge card, which requires the balance to be repaid in full each month or at the end of each statement cycle. In contrast, credit cards allow the consumers to build a continuing balance of debt, subject to interest being charged. A credit card differs from a charge card also in that a credit card typically involves a third-party entity that pays the seller and is reimbursed by the buyer, whereas a charge card simply defers payment by the buyer until a later date.



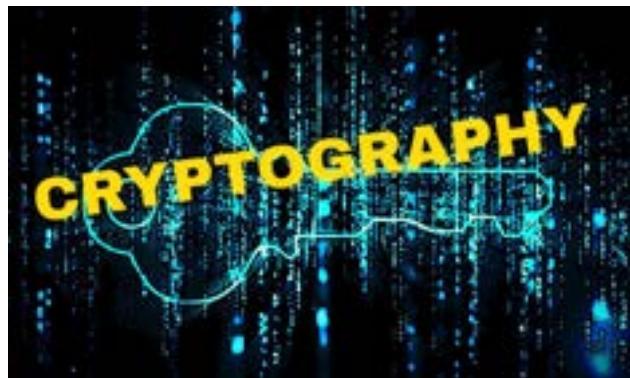
Cross-validation (statistics)

Cross-validation, sometimes called rotation estimation or out-of-sample testing, is any of various similar model validation techniques for assessing how the results of a statistical analysis will generalize to an independent data set.



Cryptography

Cryptography, or cryptology (from Ancient Greek: κρυπτολογία, romanized: kryptos "hidden, secret"; and γράφειν, graphein, "to write", or -λογία, -logia, "study", respectively), is the practice and study of techniques for secure communication in the presence of adversarial behavior. More generally, cryptography is about constructing and analyzing protocols that prevent third parties or the public from reading private messages. Modern cryptography exists at the intersection of the disciplines of mathematics, computer science, information security, electrical engineering, digital signal processing, physics, and others. Core concepts related to information security (data confidentiality, data integrity, authentication, and non-repudiation) are also central to cryptography. Practical applications of cryptography include electronic commerce, chip-based payment cards, digital currencies, computer passwords, and military communications.



Curlie

DMOZ (from directory.mozilla.org, an earlier domain name, stylized in lowercase in its logo) was a multilingual open-content directory of World Wide Web links. The site and community who maintained it were also known as the Open Directory Project (ODP). It was owned by AOL (now a part of Verizon Media) but constructed and maintained by a community of volunteer editors.



Cursor (user interface)

In human-computer interaction, a cursor is an indicator used to show the current position on a computer monitor or other display device that will respond to text input.



Cybernetics

Cybernetics is a wide-ranging field concerned with circular causal processes such as feedback. Norbert Wiener named the field after an example of circular causal feedback - that of steering a ship where the helmsman adjusts their steering in response to the effect it is observed as having, enabling a steady course to be maintained amongst disturbances such as cross-winds or the tide. Cybernetics is concerned with circular causal processes however they are embodied, including in ecological, technological, biological, cognitive and social systems and also in the context of practical activities such as designing, learning, managing, etc. Its transdisciplinary character has meant that cybernetics intersects with a number of other fields, leading to it having both wide influence and diverse interpretations.



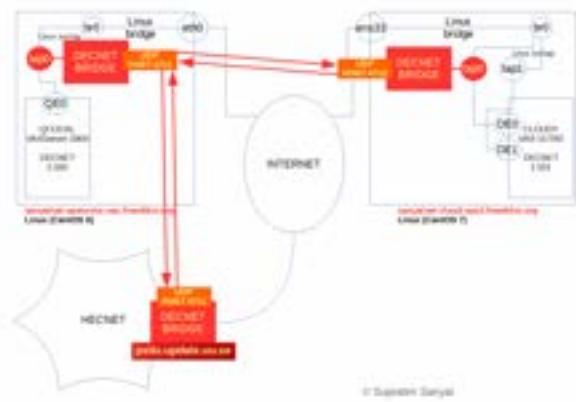
Cyberwarfare

Cyberwarfare is the use of cyber attacks against an enemy state, causing comparable harm to actual warfare and/or disrupting vital computer systems. Some intended outcomes could be espionage, sabotage, propaganda, manipulation or economic warfare.



DECnet

DECnet is a suite of network protocols created by Digital Equipment Corporation. Originally released in 1975 in order to connect two PDP-11 minicomputers, it evolved into one of the first peer-to-peer network architectures, thus transforming DEC into a networking powerhouse in the 1980s. Initially built with three layers, it later (1982) evolved into a seven-layer OSI-compliant networking protocol.



© Deepak Sanyal

DOS/360

Disk Operating System/360, also DOS/360, or simply DOS, is the discontinued first member of a sequence of operating systems for IBM System/360, System/370 and later mainframes. It was announced by IBM on the last day of 1964, and it was first delivered in June 1966. In its time, DOS/360 was the most widely used operating system in the world.



DVD

The DVD (common abbreviation for Digital Video Disc or Digital Versatile Disc) is a digital optical disc data storage format. It was invented and developed in 1995 and first released on November 1, 1996, in Japan. The medium can store any kind of digital data and has been widely used for video programs (watched using DVD players) or formerly for storing software and other computer files as well. DVDs offer significantly higher storage capacity than compact discs (CD) while having the same dimensions. A standard DVD can store up to 4.7 GB of storage, while variants can store up to a maximum of 17.08 GB. Prerecorded DVDs are mass-produced using molding machines that physically stamp data onto the DVD. Such discs are a form of DVD-ROM because data can only be read and not written or erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased many times.



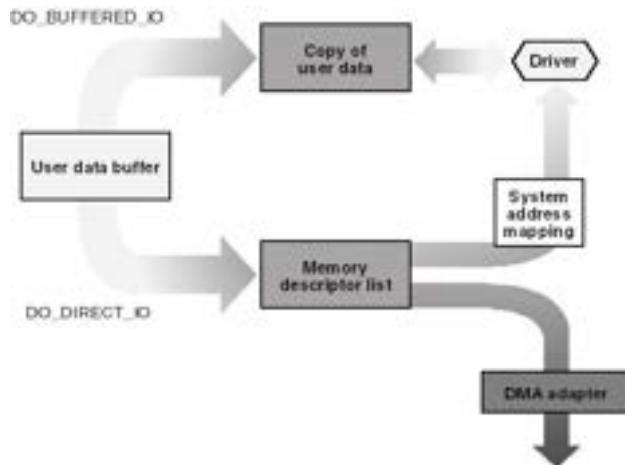
Daemon (computing)

In multitasking computer operating systems, a daemon (or) is a computer program that runs as a background process, rather than being under the direct control of an interactive user. Traditionally, the process names of a daemon end with the letter d, for clarification that the process is in fact a daemon, and for differentiation between a daemon and a normal computer program. For example, syslogd is a daemon that implements system logging facility, and sshd is a daemon that serves incoming SSH connections.



Data buffer

In computer science, a data buffer (or just buffer) is a region of a memory used to temporarily store data while it is being moved from one place to another. Typically, the data is stored in a buffer as it is retrieved from an input device (such as a microphone) or just before it is sent to an output device (such as speakers). However, a buffer may be used when moving data between processes within a computer. This is comparable to buffers in telecommunication. Buffers can be implemented in a fixed memory location in hardware?or by using a virtual data buffer in software, pointing at a location in the physical memory. In all cases, the data stored in a data buffer are stored on a physical storage medium. A majority of buffers are implemented in software, which typically use the faster RAM to store temporary data, due to the much faster access time compared with hard disk drives. Buffers are typically used when there is a difference between the rate at which data is received and the rate at which it can be processed, or in the case that these rates are variable, for example in a printer spooler or in online video streaming. In the distributed computing environment, data buffer is often implemented in the form of burst buffer that provides distributed buffering service.



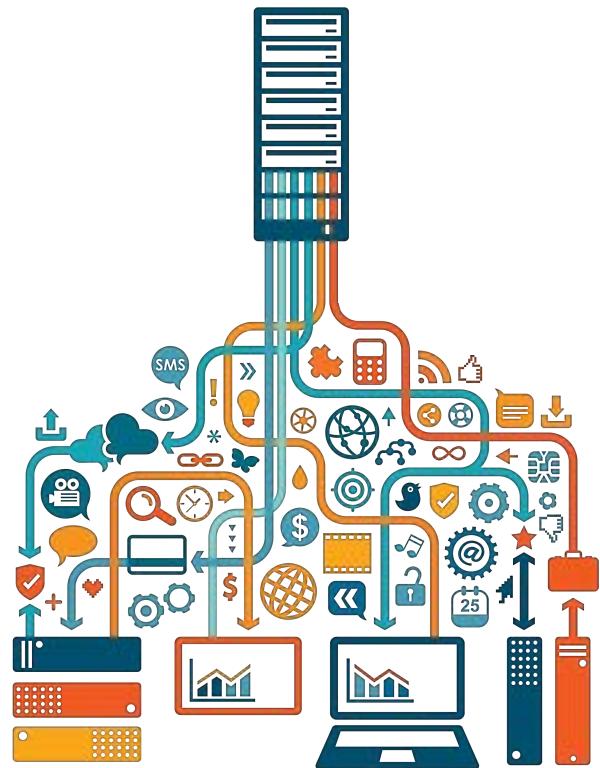
Data mining

Data mining is the process of extracting and discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. Data mining is an interdisciplinary subfield of computer science and statistics with an overall goal of extracting information (with intelligent methods) from a data set and transforming the information into a comprehensible structure for further use. Data mining is the analysis step of the "knowledge discovery in databases" process, or KDD. Aside from the raw analysis step, it also involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating. The term "data mining" is a misnomer because the goal is the extraction of patterns and knowledge from large amounts of data, not the extraction (mining) of data itself. It also is a buzzword and is frequently applied to any form of large-scale data or information processing (collection, extraction, warehousing, analysis, and statistics) as well as any application of computer decision support system, including artificial intelligence (e.g., machine learning) and business intelligence. The book Data mining: Practical machine learning tools and techniques with Java (which covers mostly machine learning material) was originally to be named Practical machine learning, and the term data mining was only added for marketing reasons. Often the more general terms (large scale) data analysis and analytics?or, when referring to actual methods, artificial intelligence and machine learning?are more appropriate.



Data storage

Data storage is the recording (storing) of information (data) in a storage medium. Handwriting, phonographic recording, magnetic tape, and optical discs are all examples of storage media. Biological molecules such as RNA and DNA are considered by some as data storage. Recording may be accomplished with virtually any form of energy. Electronic data storage requires electrical power to store and retrieve data.



Database

In computing, a database is an organized collection of data stored and accessed electronically. Small databases can be stored on a file system, while large databases are hosted on computer clusters or cloud storage. The design of databases spans formal techniques and practical considerations, including data modeling, efficient data representation and storage, query languages, security and privacy of sensitive data, and distributed computing issues, including supporting concurrent access and fault tolerance.



Dave Cutler

David Neil Cutler Sr. (born March 13, 1942) is an American software engineer. He developed several computer operating systems, namely Microsoft's Windows NT, and Digital Equipment Corporation's RSX-11M, VAXELN, and VMS.



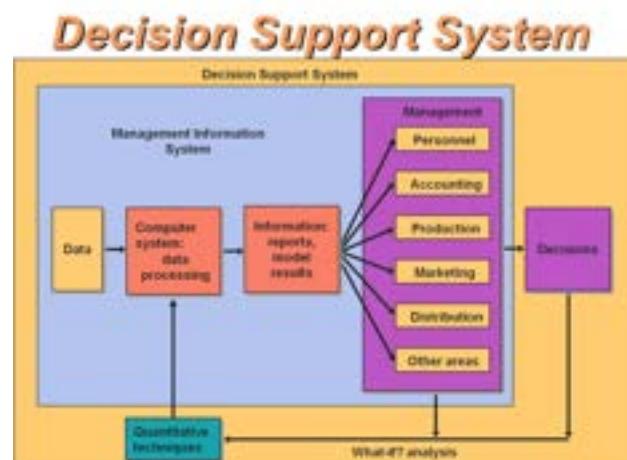
Debian

Debian (), also known as Debian GNU/Linux, is a Linux distribution composed of free and open-source software, developed by the community-supported Debian Project, which was established by Ian Murdock on August 16, 1993. The first version of Debian (0.01) was released on September 15, 1993, and its first stable version (1.1) was released on June 17, 1996. The Debian Stable branch is the most popular edition for personal computers and servers. Debian is also the basis for many other distributions, most notably Ubuntu.



Decision support system

A decision support system (DSS) is an information system that supports business or organizational decision-making activities. DSSs serve the management, operations and planning levels of an organization (usually mid and higher management) and help people make decisions about problems that may be rapidly changing and not easily specified in advance?i.e. unstructured and semi-structured decision problems. Decision support systems can be either fully computerized or human-powered, or a combination of both.



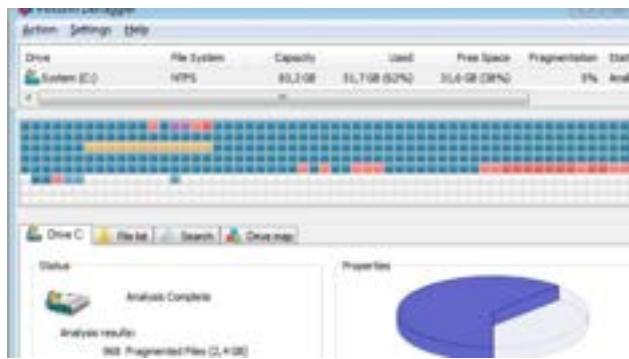
Defense Advanced Research Projects Agency

The Defense Advanced Research Projects Agency (DARPA) is a research and development agency of the United States Department of Defense responsible for the development of emerging technologies for use by the military. Originally known as the Advanced Research Projects Agency (ARPA), the agency was created on February 7, 1958, by President Dwight D. Eisenhower in response to the Soviet launching of Sputnik 1 in 1957. By collaborating with academia, industry, and government partners, DARPA formulates and executes research and development projects to expand the frontiers of technology and science, often beyond immediate U.S. military requirements. The Economist has called DARPA the agency "that shaped the modern world," and pointed out that "Moderna's COVID-19 vaccine sits alongside weather satellites, GPS, drones, stealth technology, voice interfaces, the personal computer and the internet on the list of innovations for which DARPA can claim at least partial credit." Its track record of success has inspired governments around the world to launch similar research and development agencies. DARPA is independent of other military research and development and reports directly to senior Department of Defense management. DARPA comprises approximately 220 government employees in six technical offices, including nearly 100 program managers, who together oversee about 250 research and development programs. The name of the organization first changed from its founding name, ARPA, to DARPA, in March 1972, changing back to ARPA in February 1993, then reverted to DARPA in March 1996. The agency's current director, appointed in March 2021, is Stefanie Tompkins.



Defragmentation

In the maintenance of file systems, defragmentation is a process that reduces the degree of fragmentation. It does this by physically organizing the contents of the mass storage device used to store files into the smallest number of contiguous regions (fragments, extents). It also attempts to create larger regions of free space using compaction to impede the return of fragmentation. Some defragmentation utilities try to keep smaller files within a single directory together, as they are often accessed in sequence.



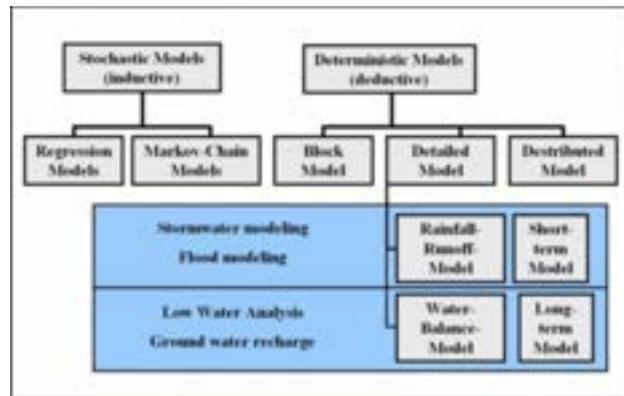
Dependability

In systems engineering, dependability is a measure of a system's availability, reliability, maintainability, and in some cases, other characteristics such as durability, safety and security. In real-time computing, dependability is the ability to provide services that can be trusted within a time-period. The service guarantees must hold even when the system is subject to attacks or natural failures.



Deterministic system

In mathematics, computer science and physics, a deterministic system is a system in which no randomness is involved in the development of future states of the system. A deterministic model will thus always produce the same output from a given starting condition or initial state.



Device driver

In computing, a device driver is a computer program that operates or controls a particular type of device that is attached to a computer or automaton. A driver provides a software interface to hardware devices, enabling operating systems and other computer programs to access hardware functions without needing to know precise details about the hardware being used.



Device file

In Unix-like operating systems, a device file or special file is an interface to a device driver that appears in a file system as if it were an ordinary file. There are also special files in DOS, OS/2, and Windows. These special files allow an application program to interact with a device by using its device driver via standard input/output system calls. Using standard system calls simplifies many programming tasks, and leads to consistent user-space I/O mechanisms regardless of device features and functions.

The screenshot shows a 'Device File Explorer' window with a list of device files. The columns are 'Name', 'Permissions', 'Size', and 'Last modified'. A red circle labeled '3' is on the 'Name' column header. A red circle labeled '2' is on the top right corner of the window. A red circle labeled '1' is on the bottom right corner of the window.

Name	Permissions	Last modified	Size
/dev/asset	drwxrwxr-x	2022-07-27 21:58	4.0K
/dev/proc	drwxr-xr-x	2022-10-28 11:49	1.2 KB
/dev/kms	drwxr-xr-x	2022-07-27 21:58	11.8
/dev/cache	drwxrwxr-x	2022-07-27 21:58	4.4K
/dev/config	drwxrwxr-x	2022-07-27 21:58	0.0
/dev/urandom	drwxr-xr-x	2022-07-27 21:58	17.8
/dev/zero	drwxr-xr-x	2022-10-28 11:49	4.4K
/dev/swapctl	drwxrwxr-x	2022-10-28 11:49	12.9
/dev/debug_cambrian	drwxr-xr-x	2022-07-01 21:53	4.4K
/dev/over	drwxrwxr-x	2022-10-28 11:49	3.7 KB
/dev/vcs	drwxr-xr-x	2022-07-27 21:58	11.8
/dev/timerfd	drwxrwxr-x	2022-10-28 11:49	38.9
/dev/lockd	drwxrwxr-x	2022-07-27 22:49	16.8K
/dev/metadata	drwxrwxr-x	2022-10-28 11:49	4.4K
/dev/auxv	drwxrwxr-x	2022-10-28 11:49	33.8
/dev/nsm	drwxrwxr-x	2022-07-07 21:53	4.4K
/dev/udev_distro	drwxrwxr-x	2022-07-07 21:53	4.4K
/dev/csm	drwxrwxr-x	2022-07-27 21:58	6.8K
/dev/persistent	drwxrwxr-x	2022-07-07 21:58	4.4K
/dev/urid	drwxrwxr-x	2022-10-28 11:49	0.0
/dev/realtime	drwxrwxr-x	2022-07-07 23:38	4.4K
/dev/valuer	drwxr-xr-x	2022-07-27 21:53	21.8
/dev/secondary_stage_resources	drwxrwxr-x	2022-07-07 21:53	4.4K
/dev/storage	drwxrwxr-x	2022-10-28 11:49	81.9
-> /dev/emulated	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/c	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/Asmc	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/Android	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/data	drwxrwxr-x	2022-10-28 11:52	4.4K
-> /dev/cam.google.android.applanck	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.android.applanck.sensors	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.android.applanck.pt	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.android.applanck.gen	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.android.applanck	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.android.applanck.usb	drwxrwxr-x	2022-10-28 11:49	4.4K
-> /dev/cam.google.applanck.usb	drwxrwxr-x	2022-10-28 11:49	4.4K

Device register

A Device Register is the view any device presents to a programmer.

The screenshot shows a Microsoft Device Support registration form. At the top right is the Microsoft logo and the text "Device Support". Below that is a "Home" link and a "Get Support" button. The main area contains fields for "Country/Region" (with "Select country" placeholder text) and "Product Family Type" (with a dropdown menu showing "Product Family Type" as the selected item, followed by "Surface", "XBOX", "Band", and "Phones"). A checkbox labeled "I accept the terms of the Privacy Statement" is present, with a small explanatory text below it. At the bottom is a blue "Register" button.

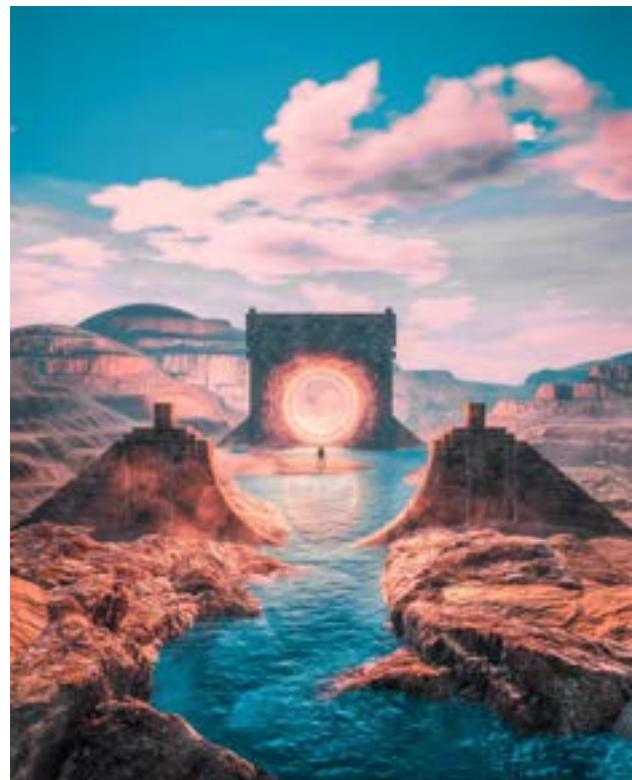
Digital Equipment Corporation

Digital Equipment Corporation (DEC), using the trademark Digital, was a major American company in the computer industry from the 1960s to the 1990s. The company was co-founded by Ken Olsen and Harlan Anderson in 1957. Olsen was president until forced to resign in 1992, after the company had gone into precipitous decline.



Digital art

Digital art refers to any artistic work or practice that uses digital technology as part of the creative or presentation process. It can also refer to computational art that uses and engages with digital media. Since the 1960s, various names have been used to describe digital art, including computer art, multimedia art and new media art.



Digital library

A digital library, also called an online library, an internet library, a digital repository, or a digital collection is an online database of digital objects that can include text, still images, audio, video, digital documents, or other digital media formats or a library accessible through the internet. Objects can consist of digitized content like print or photographs, as well as originally produced digital content like word processor files or social media posts. In addition to storing content, digital libraries provide means for organizing, searching, and retrieving the content contained in the collection. Digital libraries can vary immensely in size and scope, and can be maintained by individuals or organizations. The digital content may be stored locally, or accessed remotely via computer networks. These information retrieval systems are able to exchange information with each other through interoperability and sustainability.



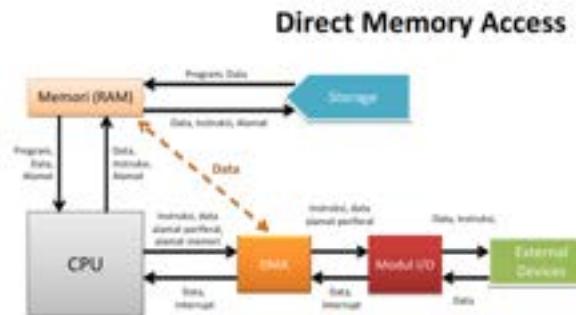
Digital marketing

Digital marketing is the component of marketing that uses the Internet and online based digital technologies such as desktop computers, mobile phones and other digital media and platforms to promote products and services. Its development during the 1990s and 2000s changed the way brands and businesses use technology for marketing. As digital platforms became increasingly incorporated into marketing plans and everyday life, and as people increasingly use digital devices instead of visiting physical shops, digital marketing campaigns have become prevalent, employing combinations of search engine optimization (SEO), search engine marketing (SEM), content marketing, influencer marketing, content automation, campaign marketing, data-driven marketing, e-commerce marketing, social media marketing, social media optimization, e-mail direct marketing, display advertising, e-books, and optical disks and games have become commonplace. Digital marketing extends to non-Internet channels that provide digital media, such as television, mobile phones (SMS and MMS), callback, and on-hold mobile ring tones. The extension to non-Internet channels differentiates digital marketing from online marketing.



Direct memory access

Direct memory access (DMA) is a feature of computer systems that allows certain hardware subsystems to access main system memory independently of the central processing unit (CPU).



Directory (computing)

In computing, a directory is a file system cataloging structure which contains references to other computer files, and possibly other directories. On many computers, directories are known as folders, or drawers, analogous to a workbench or the traditional office filing cabinet. The name derives from books like a telephone directory that lists the phone numbers of all the people living in a certain area.

```
C:\Windows\Temp
Volume in drive C is C:
Volume Serial Number is 74F5-693C

Directory of C:\Temp

2009-08-25  11:59    <DIR>          .
2009-08-25  11:59    <DIR>          ..
2009-08-01  11:37                2,371,600 Adobeduplicator12345.exe
2009-08-01  11:03      27,908 dd_ddpcheckdisk01-08-10.txt
2009-08-01  10:01      764 dd_ddpnetfiltererror.txt
2009-08-01  09:45      10,541 dd_ddpnetfilterinstall1.txt
2009-08-01  09:45      35,145 dd_ddpnetfilterlog.log
2009-08-01  09:45      255 kernel32.dll
2009-08-01  09:45      482 MS12-006-106
2009-08-20  09:17      1,145 nsiupdate.exe
2009-08-14  16:14      38,895 office113.log
2009-08-03  16:02      <DIR>          officePatches
2009-08-14  14:20      <DIR>          osint
2009-08-01  11:37      16,384 osint113.log.001.osint_c9.dat
2009-08-01  11:37      1,744 osint113.log.txt
2009-08-25  11:47      50,245,632 WIN7SP1_000
2009-08-20  10:07      1,197 [AC]TMGABN-7A07-1033-7B44-AE33000000001-[ac]
2009-08-20  10:07      637 [AC]TMGABN-7A07-1033-7B44-AE33000000001-[ac]
21 file(s)        52,721,976 bytes
4 direc(s)     83,709,288,768 bytes free
```

Directory structure

In computing, a directory structure is the way an operating system arranges files that are accessible to the user. Files are typically displayed in a hierarchical tree structure.



Discrete mathematics

Discrete mathematics is the study of mathematical structures that can be considered "discrete" (in a way analogous to discrete variables, having a bijection with the set of natural numbers) rather than "continuous" (analogously to continuous functions). Objects studied in discrete mathematics include integers, graphs, and statements in logic. By contrast, discrete mathematics excludes topics in "continuous mathematics" such as real numbers, calculus or Euclidean geometry. Discrete objects can often be enumerated by integers; more formally, discrete mathematics has been characterized as the branch of mathematics dealing with countable sets (finite sets or sets with the same cardinality as the natural numbers). However, there is no exact definition of the term "discrete mathematics". The set of objects studied in discrete mathematics can be finite or infinite. The term finite mathematics is sometimes applied to parts of the field of discrete mathematics that deals with finite sets, particularly those areas relevant to business.

Valid Conditionals:

- 1) $\forall x A(x) \rightarrow \exists x A(x)$
- 2) $\exists x (A(x) \wedge B(x)) \rightarrow (\exists x A(x) \wedge \exists x B(x))$
- 3) $(\forall x A(x) \vee \forall x B(x)) \rightarrow \forall x (A(x) \vee B(x))$
- 4) $\forall (x) (A(x) \rightarrow B(x)) \rightarrow (\forall (x) A(x) \rightarrow \forall (x) B(x))$
- 5) $\exists y \forall x P(x, y) \rightarrow \exists y \forall x \exists y P(x, y)$
- 6) $\exists x \forall y P(x, y) \rightarrow \forall y \exists x P(x, y)$

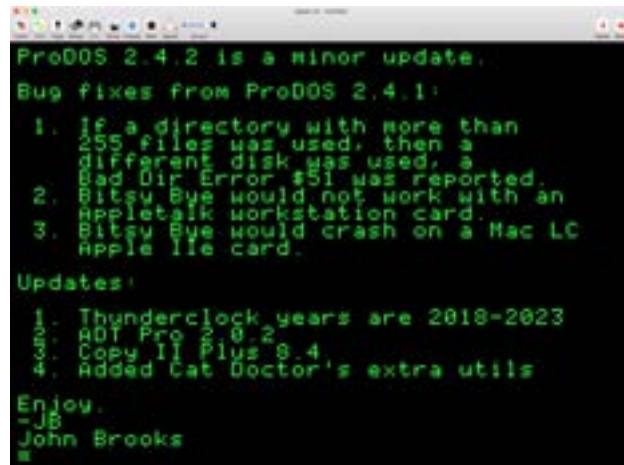
Equivalences:

1. $\sim [\forall x W(x)] \Leftrightarrow \exists x \sim W(x)$
2. $\sim [\exists x W(x)] \Leftrightarrow \forall x \sim W(x)$
3. $\forall x \forall y W(x, y) \Leftrightarrow \forall y \forall x W(x, y)$
4. $\exists x \exists y W(x, y) \Leftrightarrow \exists y \exists x W(x, y)$
5. $\exists x (A(x) \rightarrow B(x)) \Leftrightarrow [\forall x A(x) \rightarrow \exists x B(x)]$
6. $\exists x (A(x) \vee B(x)) \Leftrightarrow [\exists x A(x) \vee \exists x B(x)]$
7. $\forall x (A(x) \wedge B(x)) \Leftrightarrow \forall x [A(x) \wedge B(x)]$

Simplification: $\forall x (P(x) \rightarrow C) \Leftrightarrow \exists x A(x) \rightarrow C$
 $\exists x (A(x) \rightarrow C) \Leftrightarrow \forall x A(x) \rightarrow C$

Disk operating system

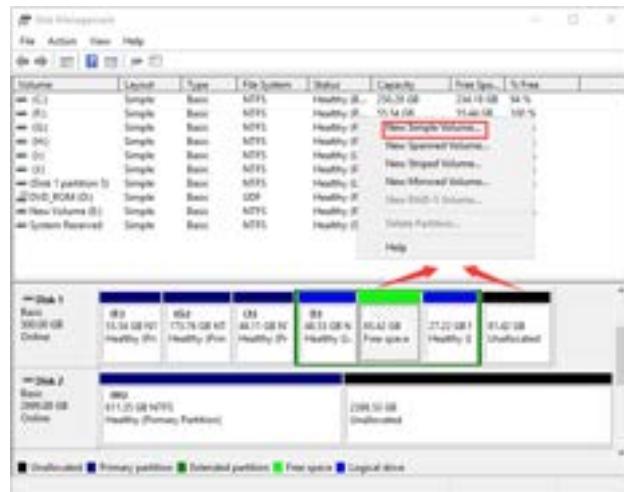
A disk operating system (DOS) is a computer operating system that resides on and can use a disk storage device, such as a floppy disk, hard disk drive, or optical disc. A disk operating system provides a file system for organizing, reading, and writing files on the storage disk. Strictly, this definition does not include any other functionality, so it does not apply to more complex OSes, such as Microsoft Windows, and is more appropriately used only for older generations of operating systems.



ProDOS 2.4.2 is a minor update.
Bug fixes from ProDOS 2.4.1:
1. If a directory with more than
255 files was used, then a
different disk was used, a
Bad Dir Error #51 was reported.
2. Bitsy Bye would not work with an
Appletalk workstation card.
3. Bitsy Bye would crash on a Mac LC
Apple IIGe card.
Updates:
1. Thunderclock years are 2018-2023
2. ADT Pro 2.0.2
3. Copy II Plus 0.4
4. Added Cat Doctor's extra utils
Enjoy.
-JB
John Brooks

Disk partitioning

Disk partitioning or disk slicing is the creation of one or more regions on secondary storage, so that each region can be managed separately. These regions are called partitions. It is typically the first step of preparing a newly installed disk, before any file system is created. The disk stores the information about the partitions' locations and sizes in an area known as the partition table that the operating system reads before any other part of the disk. Each partition then appears to the operating system as a distinct "logical" disk that uses part of the actual disk. System administrators use a program called a partition editor to create, resize, delete, and manipulate the partitions. Partitioning allows the use of different filesystems to be installed for different kinds of files. Separating user data from system data can prevent the system partition from becoming full and rendering the system unusable. Partitioning can also make backing up easier. A disadvantage is that it can be difficult to properly size partitions, resulting in having one partition with too much free space and another nearly totally allocated.



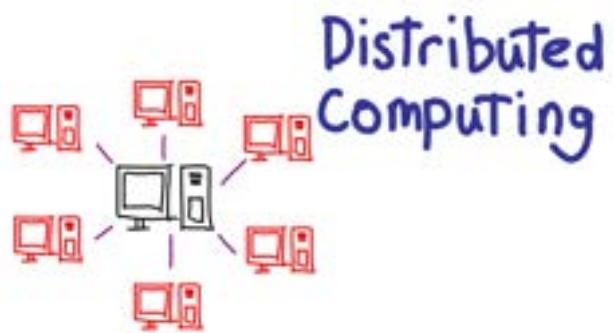
Distributed artificial intelligence

Distributed Artificial Intelligence (DAI) also called Decentralized Artificial Intelligence is a subfield of artificial intelligence research dedicated to the development of distributed solutions for problems. DAI is closely related to and a predecessor of the field of multi-agent systems.



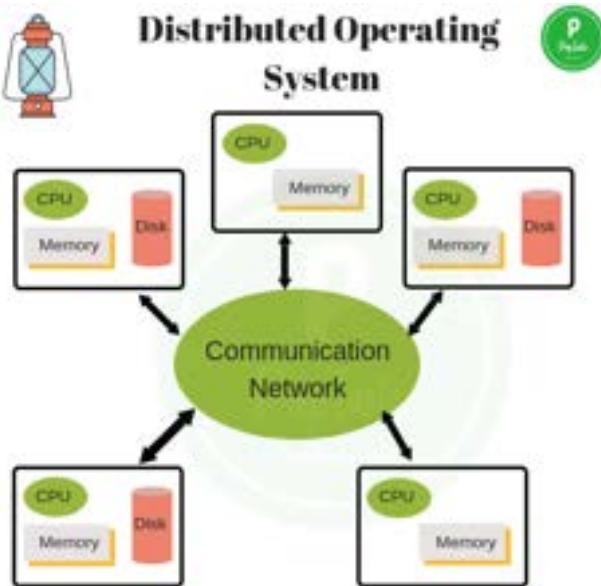
Distributed computing

A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. Distributed computing is a field of computer science that studies distributed systems.



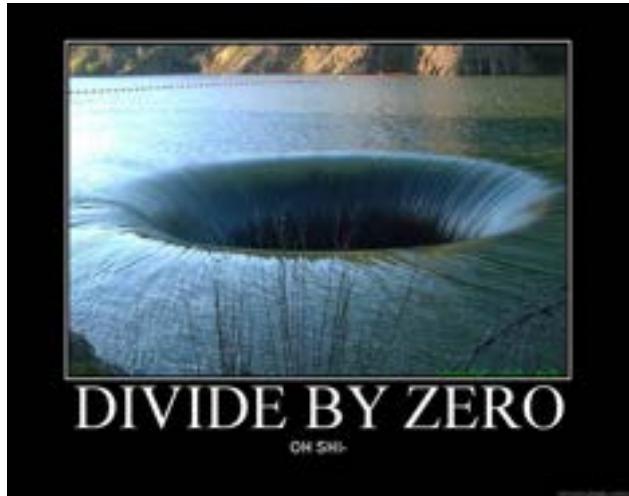
Distributed operating system

A distributed operating system is system software over a collection of independent software, networked, communicating, and physically separate computational nodes. They handle jobs which are serviced by multiple CPUs. Each individual node holds a specific software subset of the global aggregate operating system. Each subset is a composite of two distinct service provisoners. The first is a ubiquitous minimal kernel, or microkernel, that directly controls that node's hardware. Second is a higher-level collection of system management components that coordinate the node's individual and collaborative activities. These components abstract microkernel functions and support user applications. The microkernel and the management components collection work together. They support the system's goal of integrating multiple resources and processing functionality into an efficient and stable system. This seamless integration of individual nodes into a global system is referred to as transparency, or single system image; describing the illusion provided to users of the global system's appearance as a single computational entity.



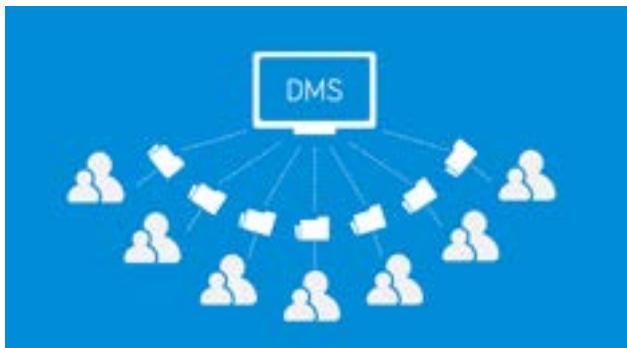
Division by zero

In mathematics, division by zero is division where the divisor (denominator) is zero. Such a division can be formally expressed as



Document management system

A document management system (DMS) is usually a computerized system used to store, share, track and manage files or documents. Some systems include history tracking where a log of the various versions created and modified by different users is recorded. The term has some overlap with the concepts of content management systems. It is often viewed as a component of enterprise content management (ECM) systems and related to digital asset management, document imaging, workflow systems and records management systems.



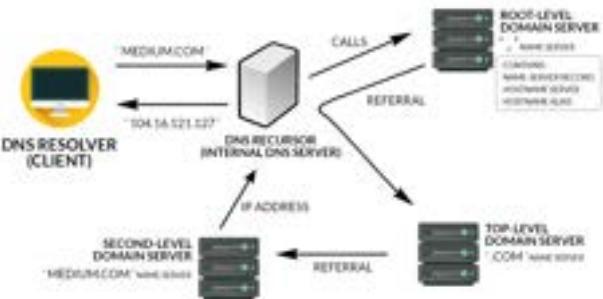
Doi (identifier)

A digital object identifier (DOI) is a persistent identifier or handle used to uniquely identify various objects, standardized by the International Organization for Standardization (ISO). DOIs are an implementation of the Handle System; they also fit within the URI system (Uniform Resource Identifier). They are widely used to identify academic, professional, and government information, such as journal articles, research reports, data sets, and official publications. DOIs have also been used to identify other types of information resources, such as commercial videos.



Domain Name System

The Domain Name System (DNS) is a hierarchical and distributed naming system for computers, services, and other resources in the Internet or other Internet Protocol (IP) networks. It associates various information with domain names assigned to each of the associated entities. Most prominently, it translates readily memorized domain names to the numerical IP addresses needed for locating and identifying computer services and devices with the underlying network protocols. The Domain Name System has been an essential component of the functionality of the Internet since 1985.



Domain-specific language

A domain-specific language (DSL) is a computer language specialized to a particular application domain. This is in contrast to a general-purpose language (GPL), which is broadly applicable across domains. There are a wide variety of DSLs, ranging from widely used languages for common domains, such as HTML for web pages, down to languages used by only one or a few pieces of software, such as MUSH soft code. DSLs can be further subdivided by the kind of language, and include domain-specific markup languages, domain-specific modeling languages (more generally, specification languages), and domain-specific programming languages. Special-purpose computer languages have always existed in the computer age, but the term "domain-specific language" has become more popular due to the rise of domain-specific modeling. Simpler DSLs, particularly ones used by a single application, are sometimes informally called mini-languages.

DOMAIN-SPECIFIC VOCABULARY

Domain-specific vocabulary refers to the words that are related to a specific field of study.

Read each list of words. Identify the domain (topic) for each list, and write it at the top of the list.

Body Organs	Animal Preservation	Economics
liver kidneys lungs	wildlife conservation endangered	consumer goods & services supply & demand
Water Cycle	Outer Space	Author's Purposes for Writing
evaporation condensation precipitation	galaxy planets asteroids	persuade inform entertain
States of Matter	Landforms	Branches of Government
solid liquid gas	plateau mountain peninsula	executive judicial legislative

Donella Meadows

Donella Hager "Dana" Meadows (March 13, 1941 – February 20, 2001) was an American environmental scientist, educator, and writer. She is best known as lead author of the books *The Limits to Growth* and *Thinking In Systems: A Primer*.



Doubling time

The doubling time is the time it takes for a population to double in size/value. It is applied to population growth, inflation, resource extraction, consumption of goods, compound interest, the volume of malignant tumours, and many other things that tend to grow over time. When the relative growth rate (not the absolute growth rate) is constant, the quantity undergoes exponential growth and has a constant doubling time or period, which can be calculated directly from the growth rate.

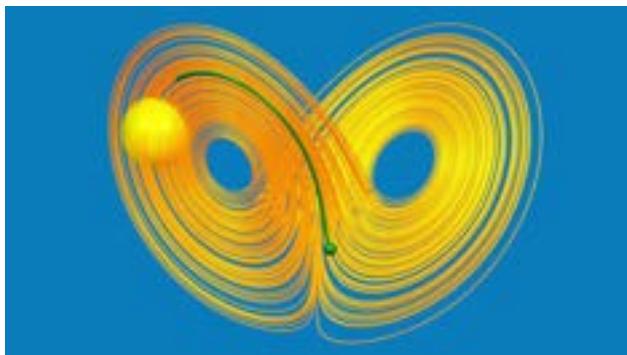
Doubling Time Formula

$$\text{Doubling Time} = \frac{\ln(2)}{\ln(1+r)}$$

$$\text{Doubling Time} = \frac{70}{r}$$

Dynamical system

In mathematics, a dynamical system is a system in which a function describes the time dependence of a point in an ambient space. Examples include the mathematical models that describe the swinging of a clock pendulum, the flow of water in a pipe, the random motion of particles in the air, and the number of fish each springtime in a lake. The most general definition unifies several concepts in mathematics such as ordinary differential equations and ergodic theory by allowing different choices of the space and how time is measured. Time can be measured by integers, by real or complex numbers or can be a more general algebraic object, losing the memory of its physical origin, and the space may be a manifold or simply a set, without the need of a smooth space-time structure defined on it.



E-commerce

E-commerce (electronic commerce) is the activity of electronically buying or selling of products on online services or over the Internet. E-commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. E-commerce is in turn driven by the technological advances of the semiconductor industry, and is the largest sector of the electronics industry.



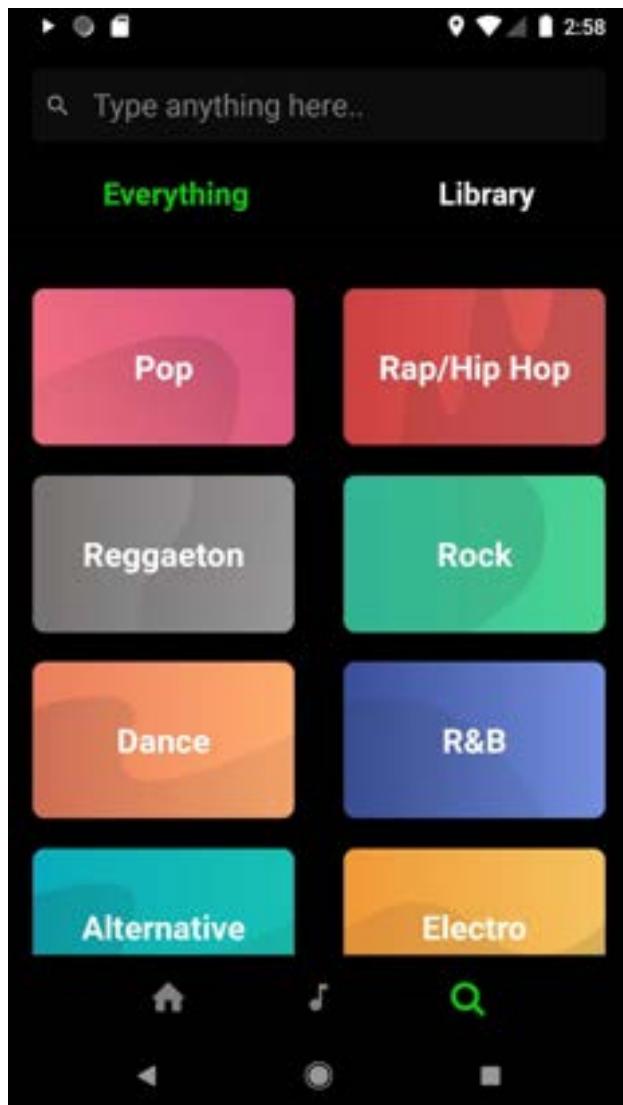
eCos

The Embedded Configurable Operating System (eCos) is a free and open-source real-time operating system intended for embedded systems and applications which need only one process with multiple threads. It is designed to be customizable to precise application requirements of run-time performance and hardware needs. It is implemented in the programming languages C and C++ and has compatibility layers and application programming interfaces for Portable Operating System Interface (POSIX) and The Real-time Operating system Nucleus (TRON) variant ITRON. eCos is supported by popular SSL/TLS libraries such as wolfSSL, thus meeting all standards for embedded security.



ESound

In computing, the Enlightened Sound Daemon (ESD or EsounD) was the sound server for Enlightenment and GNOME. Esound is a small sound daemon for both Linux and UNIX. ESD was created to provide a consistent and simple interface to the audio device, so applications do not need to have different driver support written per architecture. It was also designed to enhance capabilities of audio devices such as allowing more than one application to share an open device. ESD accomplishes these things while remaining transparent to the application, meaning that the application developer can simply provide ESD support and let it do the rest. On top of this, the API is designed to be very similar to the current audio device API, making it easy to port to ESD.



ETH Zürich

ETH Zurich (English: ETH; Swiss Federal Institute of Technology in Zürich; German: Eidgenössische Technische Hochschule Zürich) is a public research university in Zürich, Switzerland. Founded by the Swiss federal government in 1854, it was modeled on the École polytechnique in Paris, with the stated mission to educate engineers and scientists; the school focuses primarily on science, technology, engineering, and mathematics, although its 16 departments span a variety of disciplines and subjects. Like its sister institution, the Swiss Federal Institute of Technology in Lausanne (EPFL), ETH Zurich is part of the Swiss Federal Institutes of Technology Domain, a consortium of government universities and research institutes under the Swiss Federal Department of Economic Affairs, Education and Research. As a public institution, it grants admission to every Swiss resident who has matriculated. As of 2021, ETH Zurich enrolled 24,500 students from over 120 countries, of which 4,460 were pursuing doctoral degrees. ETH Zurich has a world-class reputation in academia and industry, particularly in science and technology. It regularly ranks among the top three to five universities in Europe and one of the top 15 to 20 globally. In the 2022 QS World University Rankings, the university ranked eighth in the world and fourth in Europe in academic excellence, with 2021 edition placing it fourth in the world for engineering and technology (second in Europe) and first for earth and marine science. The Times Higher Education World University Rankings of 2022-23 ranked ETH Zurich 11th worldwide.



EXEC 8

OS 2200 is the operating system for the Unisys ClearPath Dorado family of mainframe systems. The operating system kernel of OS 2200 is a lineal descendant of Exec 8 for the UNIVAC 1108.



Earth system science

Earth system science (ESS) is the application of systems science to the Earth. In particular, it considers interactions and 'feedbacks', through material and energy fluxes, between the Earth's sub-systems' cycles, processes and "spheres"? atmosphere, hydrosphere, cryosphere, geosphere, pedosphere, lithosphere, biosphere, and even the magnetosphere?as well as the impact of human societies on these components. At its broadest scale, Earth system science brings together researchers across both the natural and social sciences, from fields including ecology, economics, geography, geology, glaciology, meteorology, oceanography, climatology, paleontology, sociology, and space science. Like the broader subject of systems science, Earth system science assumes a holistic view of the dynamic interaction between the Earth's spheres and their many constituent subsystems fluxes and processes, the resulting spatial organization and time evolution of these systems, and their variability, stability and instability. Subsets of Earth System science include systems geology and systems ecology, and many aspects of Earth System science are fundamental to the subjects of physical geography and climate science.

The Earth System



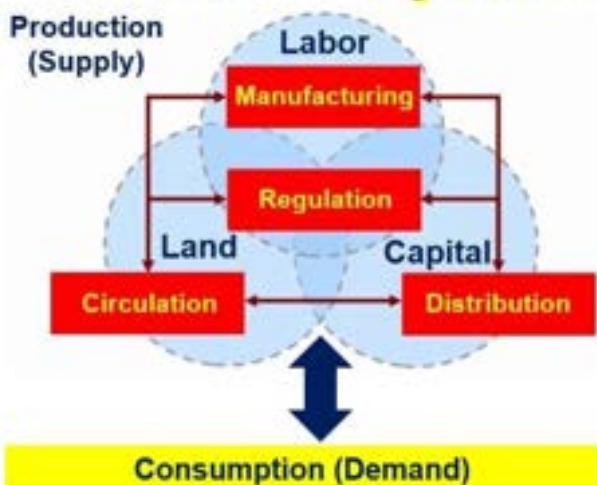
The earth system consists of positive and negative feedback loops.

Small changes caused by man such as CO₂ and other climate forcing as well as pollution impact right across all interconnected systems throughout the global commons

Economic system

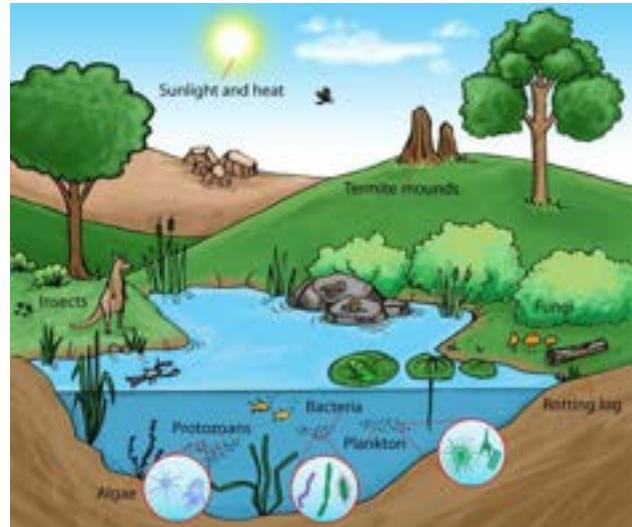
An economic system, or economic order, is a system of production, resource allocation and distribution of goods and services within a society or a given geographic area. It includes the combination of the various institutions, agencies, entities, decision-making processes, and patterns of consumption that comprise the economic structure of a given community.

Economic System



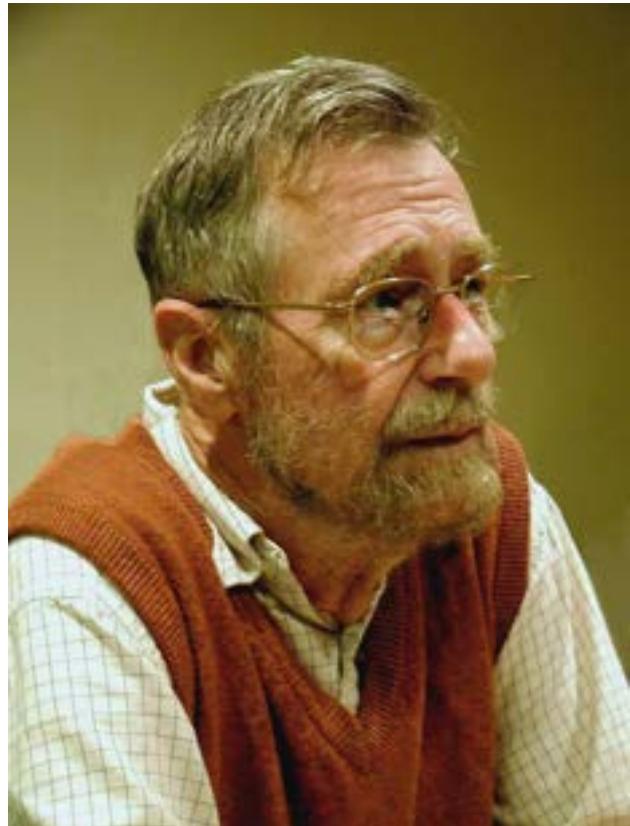
Ecosystem

An ecosystem (or ecological system) consists of all the organisms and the physical environment with which they interact.⁴⁵⁸ These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and microbes.



Edsger W. Dijkstra

Edsger Wybe Dijkstra (DYKE-str?; Dutch: [??tsx?r ??ib? ?d?ikstra] (listen); 11 May 1930 – 6 August 2002) was a Dutch computer scientist, programmer, software engineer, systems scientist, and science essayist. He received the 1972 Turing Award for fundamental contributions to developing structured programming languages, and was the Schlumberger Centennial Chair of Computer Sciences at The University of Texas at Austin from 1984 until 2000.



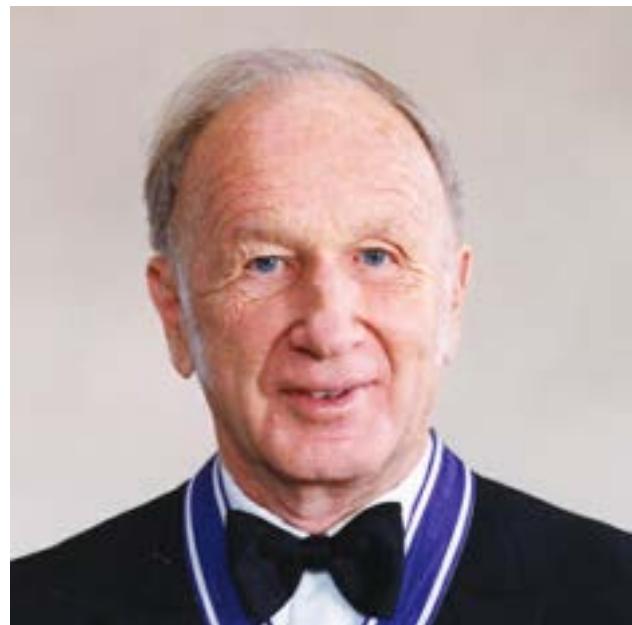
Educational technology

Educational technology (commonly abbreviated as edutech, or edtech) is the combined use of computer hardware, software, and educational theory and practice to facilitate learning. When referred to with its abbreviation, edtech, it often refers to the industry of companies that create educational technology. In addition to the practical educational experience, educational technology is based on theoretical knowledge from various disciplines such as communication, education, psychology, sociology, artificial intelligence, and computer science. It encompasses several domains including learning theory, computer-based training, online learning, and m-learning where mobile technologies are used.



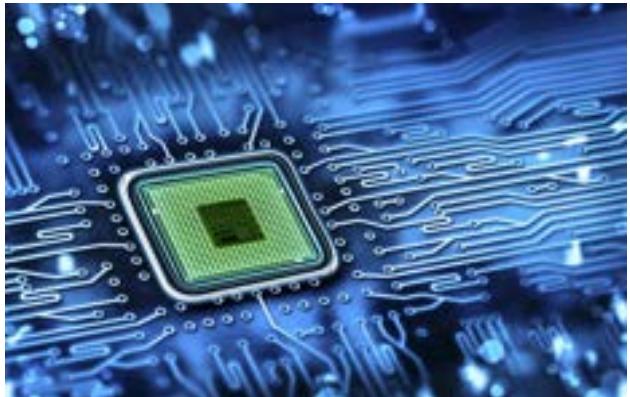
Edward Norton Lorenz

Edward Norton Lorenz (May 23, 1917 – April 16, 2008) was an American mathematician and meteorologist who established the theoretical basis of weather and climate predictability, as well as the basis for computer-aided atmospheric physics and meteorology. He is best known as the founder of modern chaos theory, a branch of mathematics focusing on the behavior of dynamical systems that are highly sensitive to initial conditions. His discovery of deterministic chaos "profoundly influenced a wide range of basic sciences and brought about one of the most dramatic changes in mankind's view of nature since Sir Isaac Newton," according to the committee that awarded him the 1991 Kyoto Prize for basic sciences in the field of earth and planetary sciences.



Electronic design automation

Electronic design automation (EDA), also referred to as electronic computer-aided design (ECAD), is a category of software tools for designing electronic systems such as integrated circuits and printed circuit boards. The tools work together in a design flow that chip designers use to design and analyze entire semiconductor chips. Since a modern semiconductor chip can have billions of components, EDA tools are essential for their design; this article in particular describes EDA specifically with respect to integrated circuits (ICs).



Electronic publishing

Electronic publishing (also referred to as publishing, digital publishing, or online publishing) includes the digital publication of e-books, digital magazines, and the development of digital libraries and catalogues. It also includes the editing of books, journals, and magazines to be posted on a screen (computer, e-reader, tablet, or smartphone).

Electronic publishing



<https://en.wikipedia.org/wiki/File:Ebookerest.jpg>

Electronic voting

Electronic voting (also known as e-voting) is voting that uses electronic means to either aid or take care of casting and counting ballots.



Embedded operating system

An embedded operating system is an operating system for embedded computer systems. Embedded operating systems are computer systems designed to increase functionality and reliability for achieving a specific task. Resource efficiency comes at the cost of losing some functionality or granularity that larger computer operating systems provide, including functions that may not be used by the specialized applications run. Depending on the method used for multitasking, this type of OS is frequently considered a real-time operating system or RTOS. Embedded systems are mostly used as Real-time operating systems.



Embedded system

An embedded system is a computer system?a combination of a computer processor, computer memory, and input/output peripheral devices?that has a dedicated function within a larger mechanical or electronic system. It is embedded as part of a complete device often including electrical or electronic hardware and mechanical parts.



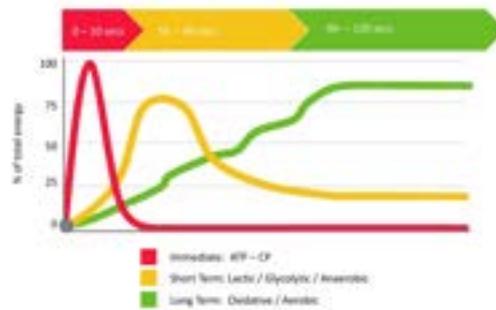
Emulator

In computing, an emulator is hardware or software that enables one computer system (called the host) to behave like another computer system (called the guest). An emulator typically enables the host system to run software or use peripheral devices designed for the guest system.



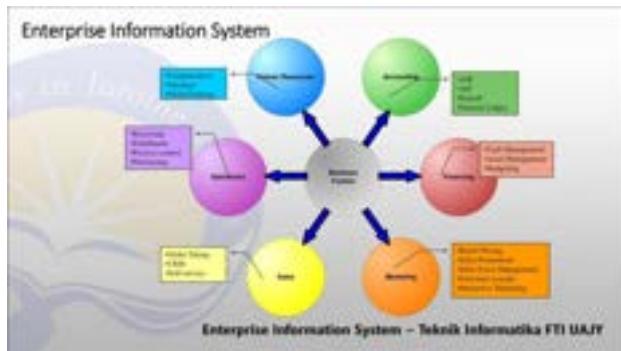
Energy system

An energy system is a system primarily designed to supply energy-services to end-users.⁹⁴¹ The intent behind energy systems is to minimise energy losses to a negligible level, as well as to ensure the efficient use of energy. The IPCC Fifth Assessment Report defines an energy system as "all components related to the production, conversion, delivery, and use of energy".¹²⁶¹ The first two definitions allow for demand-side measures, including daylighting, retrofitted building insulation, and passive solar building design, as well as socio-economic factors, such as aspects of energy demand management and remote work, while the third does not. Neither does the third account for the informal economy in traditional biomass that is significant in many developing countries. The analysis of energy systems thus spans the disciplines of engineering and economics.¹ Merging ideas from both areas to form a coherent description, particularly where macroeconomic dynamics are involved, is challenging. The concept of an energy system is evolving as new regulations, technologies, and practices enter into service ? for example, emissions trading, the development of smart grids, and the greater use of energy demand management, respectively.



Enterprise information system

An Enterprise Information System (EIS) is any kind of information system which improves the functions of enterprise business processes by integration. This means typically offering high quality of service, dealing with large volumes of data and capable of supporting some large and possibly complex organization or enterprise. An EIS must be able to be used by all parts and all levels of an enterprise. The word enterprise can have various connotations. Frequently the term is used only to refer to very large organizations such as multi-national companies or public-sector organizations. However, the term may be used to mean virtually anything, by virtue of it having become a corporate-speak buzzword.



Enterprise software

Enterprise software, also known as enterprise application software (EAS), is computer software used to satisfy the needs of an organization rather than individual users. Such organizations include businesses, schools, interest-based user groups, clubs, charities, and governments. Enterprise software is an integral part of a (computer-based) information system; a collection of such software is called an enterprise system. These systems handle a number of operations in an organization to enhance the business and management reporting tasks. The systems must process the information at a relatively high speed and can be deployed across a variety of networks. Services provided by enterprise software are typically business-oriented tools. As enterprises have similar departments and systems in common, enterprise software is often available as a suite of customizable programs. Generally, the complexity of these tools requires specialist capabilities and specific knowledge. Enterprise computing is the information technology (IT) tool that businesses use for efficient production operations and back-office support. These IT tools cover database management, customer relationship management, supply chain management, business process management and so on.



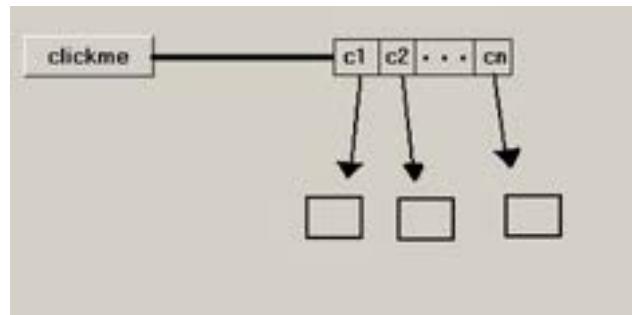
Eric Trist

Eric Lansdown Trist (11 September 1909 ? 4 June 1993) was an English scientist and leading figure in the field of organizational development (OD). He was one of the founders of the Tavistock Institute for Social Research in London.



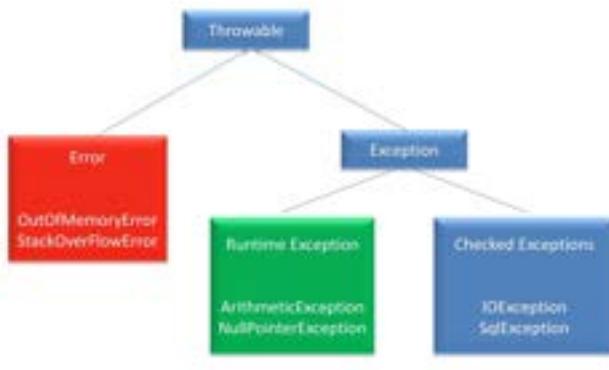
Event (computing)

In programming and software design, an event is an action or occurrence recognized by software, often originating asynchronously from the external environment, that may be handled by the software. Computer events can be generated or triggered by the system, by the user, or in other ways. Typically, events are handled synchronously with the program flow; that is, the software may have one or more dedicated places where events are handled, frequently an event loop.



Exception handling

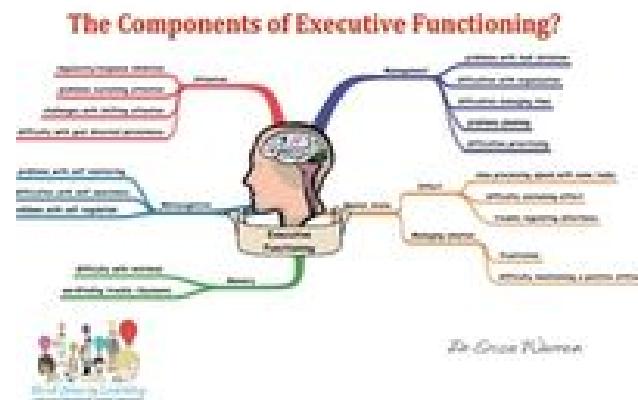
In computing and computer programming, exception handling is the process of responding to the occurrence of exceptions ? anomalous or exceptional conditions requiring special processing ? during the execution of a program. In general, an exception breaks the normal flow of execution and executes a pre-registered exception handler; the details of how this is done depend on whether it is a hardware or software exception and how the software exception is implemented. Exception handling, if provided, is facilitated by specialized programming language constructs, hardware mechanisms like interrupts, or operating system (OS) inter-process communication (IPC) facilities like signals. Some exceptions, especially hardware ones, may be handled so gracefully that execution can resume where it was interrupted.



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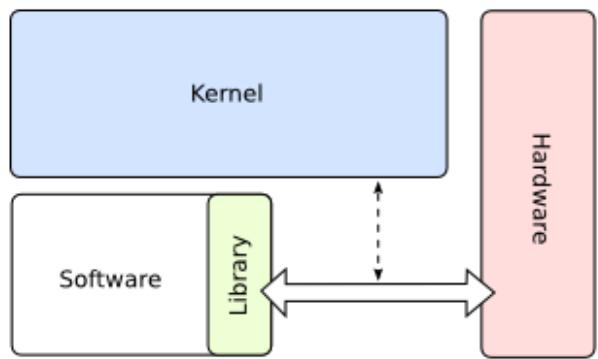
Executive Systems Problem Oriented Language

The Executive Systems Problem Oriented Language (ESPOL) is a programming language, a superset of ALGOL 60, that provides abilities of what would later be termed a system programming language or machine oriented high order language (mohol), such as interrupting a processor on a multiprocessing system (the Burroughs large systems were multiprocessor systems). ESPOL was used to write the Master Control Program (MCP) on Burroughs computer systems from the B5000 to the B6700. The single-pass compiler for ESPOL could compile over 250 lines per second.



Exokernel

Exokernel is an operating system kernel developed by the MIT Parallel and Distributed Operating Systems group, and also a class of similar operating systems.



Ext3

ext3, or third extended filesystem, is a journaled file system that is commonly used by the Linux kernel. It used to be the default file system for many popular Linux distributions. Stephen Tweedie first revealed that he was working on extending ext2 in Journaling the Linux ext2fs Filesystem in a 1998 paper, and later in a February 1999 kernel mailing list posting. The filesystem was merged with the mainline Linux kernel in November 2001 from 2.4.15 onward. Its main advantage over ext2 is journaling, which improves reliability and eliminates the need to check the file system after an unclean shutdown. Its successor is ext4.



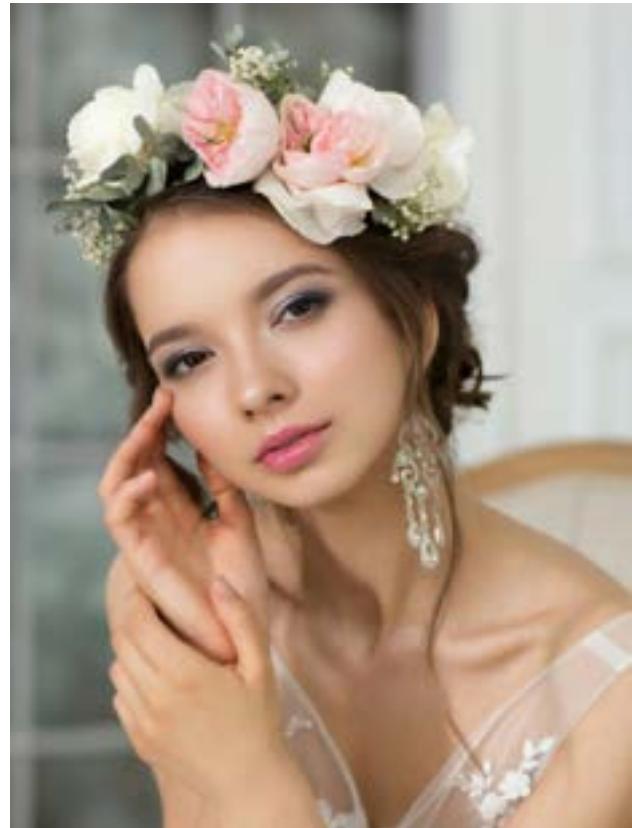
Ext4

ext4 (fourth extended filesystem) is a journaling file system for Linux, developed as the successor to ext3.



Faina Mihajlovna Kirillova

Faina Mihajlovna Kirillova (29 September 1931) is a Belarusian scientist in the field of mathematical theory of optimal control. She was the winner of the USSR Council of Ministers Prize (1986) "for the development and implementation of multi-purpose software tools for engineering calculations."



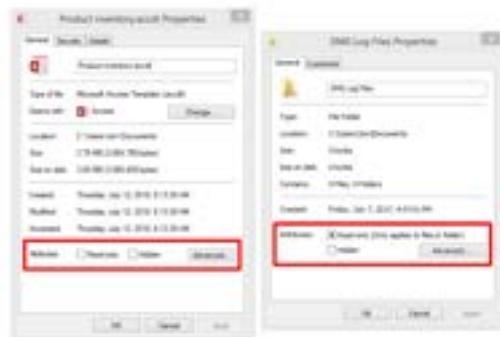
Federal Information Processing Standards

The Federal Information Processing Standards (FIPS) of the United States are a set of publicly announced standards that the National Institute of Standards and Technology (NIST) has developed for use in computer systems of non-military, American government agencies and contractors. FIPS standards establish requirements for ensuring computer security and interoperability, and are intended for cases in which suitable industry standards do not already exist. Many FIPS specifications are modified versions of standards the technical communities use, such as the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), and the International Organization for Standardization (ISO).



File attribute

File attributes are a type of meta-data that describe and may modify how files and/or directories in a filesystem behave. Typical file attributes may, for example, indicate or specify whether a file is visible, modifiable, compressed, or encrypted. The availability of most file attributes depends on support by the underlying filesystem (such as FAT, NTFS, ext4)



File locking

File locking is a mechanism that restricts access to a computer file, or to a region of a file, by allowing only one user or process to modify or delete it at a specific time and to prevent reading of the file while it's being modified or deleted.



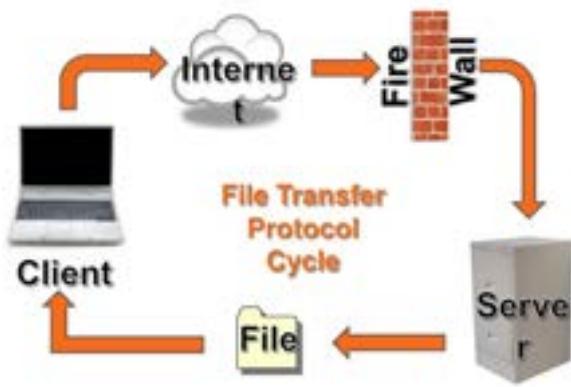
File system

In computing, a file system or filesystem (often abbreviated to fs) is a method and data structure that the operating system uses to control how data is stored and retrieved. Without a file system, data placed in a storage medium would be one large body of data with no way to tell where one piece of data stopped and the next began, or where any piece of data was located when it was time to retrieve it. By separating the data into pieces and giving each piece a name, the data are easily isolated and identified. Taking its name from the way a paper-based data management system is named, each group of data is called a "file". The structure and logic rules used to manage the groups of data and their names is called a "file system."



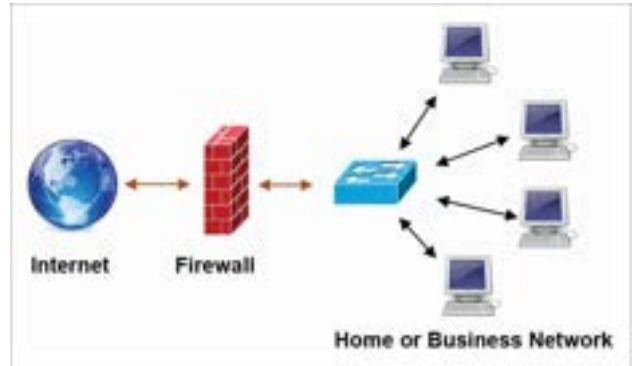
File transfer protocol

The File Transfer Protocol (FTP) is a standard communication protocol used for the transfer of computer files from a server to a client on a computer network. FTP is built on a client?server model architecture using separate control and data connections between the client and the server. FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it. For secure transmission that protects the username and password, and encrypts the content, FTP is often secured with SSL/TLS (FTPS) or replaced with SSH File Transfer Protocol (SFTP).



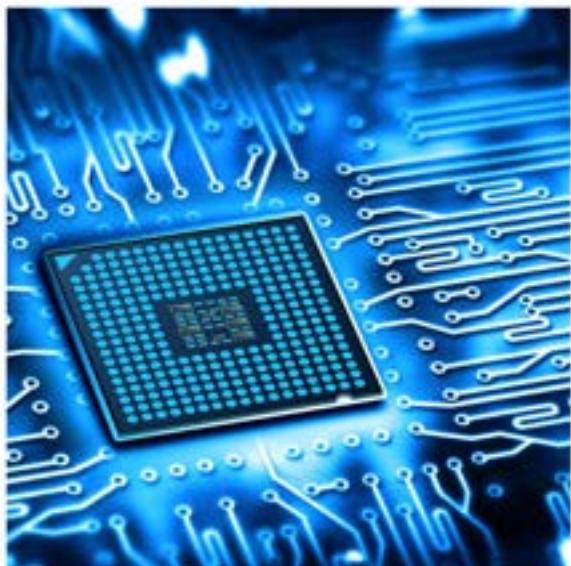
Firewall (networking)

In computing, a firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules. A firewall typically establishes a barrier between a trusted network and an untrusted network, such as the Internet.



Firmware

In computing, firmware is a specific class of computer software that provides the low-level control for a device's specific hardware. Firmware, such as the BIOS of a personal computer, may contain basic functions of a device, and may provide hardware abstraction services to higher-level software such as operating systems. For less complex devices, firmware may act as the device's complete operating system, performing all control, monitoring and data manipulation functions. Typical examples of devices containing firmware are embedded systems (running embedded software), home and personal-use appliances, computers, and computer peripherals.



Fixed-priority pre-emptive scheduling

Fixed-priority preemptive scheduling is a scheduling system commonly used in real-time systems. With fixed priority preemptive scheduling, the scheduler ensures that at any given time, the processor executes the highest priority task of all those tasks that are currently ready to execute.

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Quantifying the Sub-optimality of Uniprocessor Fixed Priority Pre-emptive Scheduling for Sporadic Tasksets with Arbitrary Deadlines

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Abstract
This paper examines the relative effectiveness of fixed priority pre-emptive scheduling in a uniprocessor system, compared to an optimal algorithm such as Earliest Deadline First (EDF). The performance metric used is the comparison of the processor speedup factor, defined as the factor by which processor speed needs to increase to ensure that any task that is schedulable according to an optimal scheduling algorithm can be scheduled using fixed priority pre-emptive scheduling. For a single task, the speedup factor is EDF / FIFO . For a two-task system, the speedup factor is 1.46279. For a three-task system, the speedup factor is lower bounded by 1.3215176322 and upper bounded by 2. (Perhaps when deadline monotonic priority assignment is used, we show that the speedup factor is exactly 2.)

1. Introduction
In this paper, we are interested in determining the largest factor by which the processing speed of a uniprocessor would need to be increased, such that any deadline-monotonic (non-preemptive) schedule according to an optimal scheduling algorithm could be produced by the preemptive scheduler according to fixed priority pre-emptive scheduling. We refer to this measure as speedup factor [14].

In 1977, Liu and Layland [14] considered fixed priority pre-emptive scheduling of synchronous¹ tasks, comprising independent periodic tasks with bounded execution times, and deadlines equal to their periods. We refer to such tasks as regular-schedule tasks. Liu and Layland showed that very monotonic priority ordering (MMPO) is the optimal fixed priority assignment policy for preemptive scheduling, and that using non-monotonic priority ordering, fixed priority pre-emptive scheduling can introduce any negative deadline offset with a cost utilising $O(n \log n)$.

Liu and Layland also showed that Earliest Deadline First (EDF) is an optimal dynamic priority scheduling algorithm for regular-schedule tasks, and that EDF can schedule any such taskset with a cost utilising $O(n^2)$.

In 1981, Fournier [11] showed that EDF is in fact an optimal fixed priority preemptive scheduling algorithm in the sense that if a valid schedule exists for a taskset, then the schedule produced by EDF will also meet all deadlines.

Combining the result of Fournier [11] with the results of Liu and Layland [14] for both EDF and fixed priority pre-emptive scheduling, we can see that the processor speedup factor remains constant for any fixed priority pre-emptive scheduling rule schedule any deadline-monotonic tasks with a cost utilising $O(n \log n)$.

Research into end-time scheduling during the 1980's and early 1990's focused on lifting many of the restrictions of the Liu and Layland task model. Task arrivals were assumed to be sporadic, with known

¹ A common confusion is that of synchronous vs. continuous execution.

Forensic software engineering

Forensic software engineering refers to the discipline of analyzing (and sometimes reconstructing) the functionality of software applications or services that have become defunct; are no longer accompanied by, or previously lacked, documentation; or for which the original engineers are no longer available.



Formal language

In logic, mathematics, computer science, and linguistics, a formal language consists of words whose letters are taken from an alphabet and are well-formed according to a specific set of rules.

	in the language	not in the language
second-to-last symbol is a	aa bbbab bbbbbbbbbababab	a aaaba bbbbbbbbb
equal numbers of a) and b)	ba bbaaba aaaabbbaabbbaaba	b bbbaa ababababababab
palindromes	a aba abababaababa	ab bbba ababababababab
contain the pattern abba	abba abaababbababbbba bbobbbbbbabbabbbbbb	abb bbbaab aaaaaaaaaaaaaa
number of bs is divisible by 3	bbb baaaaaabaaaab bbbbaaabaaabababaa	bb abababab aaaaaaaaaaaaaaab

Formal methods

In computer science, formal methods are mathematically rigorous techniques for the specification, development, analysis, and verification of software and hardware systems. The use of formal methods for software and hardware design is motivated by the expectation that, as in other engineering disciplines, performing appropriate mathematical analysis can contribute to the reliability and robustness of a design. Formal methods employ a variety of theoretical computer science fundamentals, including logic calculi, formal languages, automata theory, control theory, program semantics, type systems, and type theory.



Seven More Myths of Formal Methods

JONATHAN P. BOYD, Oxford University
MICHAEL G. HINCLIFFE, University of Cambridge

- *New myths about formal methods are gaining traction both outside and inside the system-development community. The authors address and dispel these myths based on their observations of industrial projects.*

Mathematicians often say the 19th century was the best time for learning what it could mean because it developed much and left it nothing more.

People naturally tend to feel that our only real progress and that 19th century meant... After we had to leave them recorded.

— R. W. S. [Sir Roger] Heathcote's (1884)

In 1991, Anthony Ward published a seminal article that listed and dispelled seven myths about the nature and application of formal methods.¹ Today, for many people, these same seven applications live — formal methods remain one of the most contentious areas of software engineering practice.

In essence, a myth is a belief that is widely held despite little or no evidence supporting it. Using formal methods, people can systematically specify, develop, and verify a system. However, as set down by Ward (see his page 17, *Annotations*), there are two reasons why these myths are widespread:

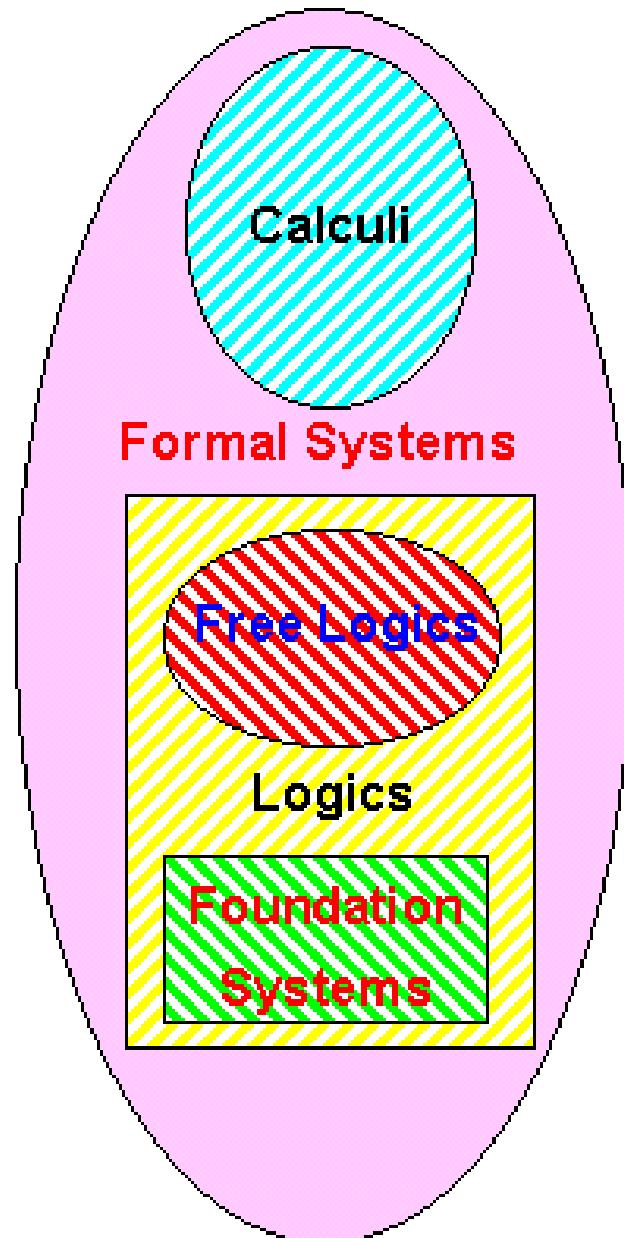
Beliefs that formal methods are mostly an academic exercise — a form of mental masturbation that has no relevance to real-world problems. The media play a major role here, as they do in so many other areas.

In many "popular press" science journals, formal methods are relegated to either deep沉思 or, worse still, as irrelevant.

Beliefs that formal methods are ... — propagated by the media. Furthermore, today these myths are held more by the public than by the system-development community. It is one reason, however, that new myths are being propagated, and over time, are becoming a common well-known misconception from the system-development community. We resonance 2001.

Formal system

A formal system is an abstract structure used for inferring theorems from axioms according to a set of rules. These rules, which are used for carrying out the inference of theorems from axioms, are the logical calculus of the formal system.



Francisco Varela

Francisco Javier Varela García

(September 7, 1946 – May 28, 2001) was a Chilean biologist, philosopher, cybernetician, and neuroscientist who, together with his mentor Humberto Maturana, is best known for introducing the concept of autopoiesis to biology, and for co-founding the Mind and Life Institute to promote dialog between science and Buddhism.



Fred Emery

Frederick Edmund Emery (27 August 1925 – 10 April 1997) was an Australian psychologist. He was one of the pioneers in the field of organizational development, particularly in the development of the theory around participative work design structures such as self-managing teams. He was widely regarded as one of the finest social scientists of his generation.



Free Software Foundation

The Free Software Foundation (FSF) is a 501(c)(3) non-profit organization founded by Richard Stallman on October 4, 1985, to support the free software movement, with the organization's preference for software being distributed under copyleft ("share alike") terms, such as with its own GNU General Public License. The FSF was incorporated in Boston, Massachusetts, US, where it is also based. From its founding until the mid-1990s, FSF's funds were mostly used to employ software developers to write free software for the GNU Project. Since the mid-1990s, the FSF's employees and volunteers have mostly worked on legal and structural issues for the free software movement and the free software community.



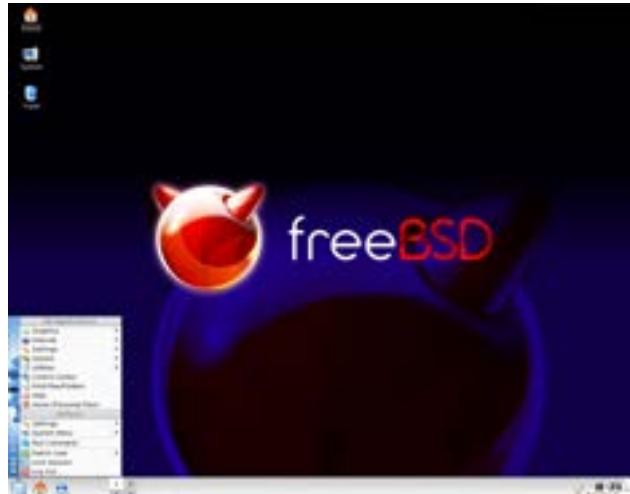
Free software

Free software or libre software is computer software distributed under terms that allow users to run the software for any purpose as well as to study, change, and distribute it and any adapted versions. Free software is a matter of liberty, not price; all users are legally free to do what they want with their copies of a free software (including profiting from them) regardless of how much is paid to obtain the program. Computer programs are deemed "free" if they give end-users (not just the developer) ultimate control over the software and, subsequently, over their devices. The right to study and modify a computer program entails that source code?the preferred format for making changes?be made available to users of that program. While this is often called "access to source code" or "public availability", the Free Software Foundation (FSF) recommends against thinking in those terms, because it might give the impression that users have an obligation (as opposed to a right) to give non-users a copy of the program.



FreeBSD

FreeBSD is a free and open-source Unix-like operating system descended from the Berkeley Software Distribution (BSD), which was based on Research Unix. The first version of FreeBSD was released in 1993. In 2005, FreeBSD was the most popular open-source BSD operating system, accounting for more than three-quarters of all installed and permissively licensed BSD systems. FreeBSD has similarities with Linux, with two major differences in scope and licensing: FreeBSD maintains a complete system, i.e. the project delivers a kernel, device drivers, userland utilities, and documentation, as opposed to Linux only delivering a kernel and drivers, and relying on third-parties for system software; FreeBSD source code is generally released under a permissive BSD license, as opposed to the copyleft GPL used by Linux.



FreeMint

MiNT is Now TOS (MiNT) is a free software alternative operating system kernel for the Atari ST system and its successors. It is a multi-tasking alternative to TOS and MagiC. Together with the free system components fVDI device drivers, XaAES graphical user interface widgets, and TeraDesk file manager, MiNT provides a free TOS compatible replacement OS that can multitask.



GM-NAA I/O

The GM-NAA I/O input/output system of General Motors and North American Aviation was the first operating system for the IBM 704 computer. It was created in 1956 by Robert L. Patrick of General Motors Research and Owen Mock of North American Aviation. It was based on a system monitor created in 1955 by programmers of General Motors for its IBM 701.



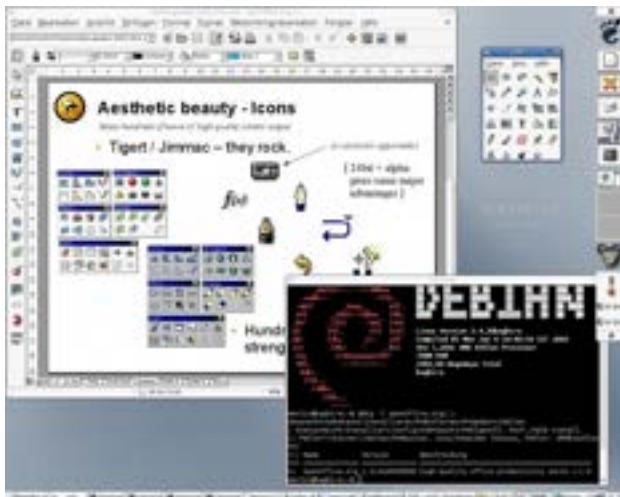
GNOME

GNOME (), originally an acronym for GNU Network Object Model Environment, is a free and open-source desktop environment for Linux and other Unix-like operating systems.



GNU Hurd

GNU Hurd is a collection of microkernel servers written as part of GNU, for the GNU Mach microkernel. It has been under development since 1990 by the GNU Project of the Free Software Foundation, designed as a replacement for the Unix kernel, and released as free software under the GNU General Public License. When the Linux kernel proved to be a viable solution, development of GNU Hurd slowed, at times alternating between stasis and renewed activity and interest. The Hurd's design consists of a set of protocols and server processes (or daemons, in Unix terminology) that run on the GNU Mach microkernel. The Hurd aims to surpass the Unix kernel in functionality, security, and stability, while remaining largely compatible with it. The GNU Project chose the multiserver microkernel for the operating system, due to perceived advantages over the traditional Unix monolithic kernel architecture, a view that had been advocated by some developers in the 1980s.



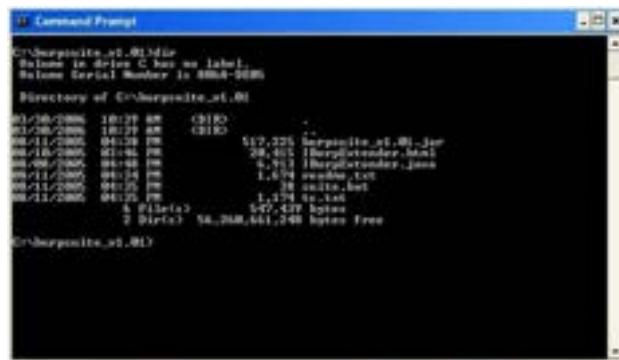
GNU Project

The GNU Project (listen) is a free software, mass collaboration project announced by Richard Stallman on September 27, 1983. Its goal is to give computer users freedom and control in their use of their computers and computing devices by collaboratively developing and publishing software that gives everyone the rights to freely run the software, copy and distribute it, study it, and modify it. GNU software grants these rights in its license.



General Comprehensive Operating System

General Comprehensive Operating System (GCOS, ; originally GECOS, General Electric Comprehensive Operating Supervisor) is a family of operating systems oriented toward the 36-bit GE/Honeywell mainframe computers. The original version of GCOS was developed by General Electric beginning in 1962. The operating system is still used today in its most recent versions (GCOS 7 and GCOS 8) on servers and mainframes produced by Groupe Bull, primarily through emulation, to provide continuity with legacy mainframe environments. GCOS 7 and GCOS 8 are separate branches of the operating system and continue to be developed alongside each other.



```
C:\Supersite\st.80\lib
Volume in drive C has no label.
Volume Serial Number is 4864-8080

Directory of C:\Supersite\st.80\lib

03/28/2000  18:27  AM    CHR0  -
03/28/2000  18:27  AM    CHR0  -
08/11/2005  04:29  PM      517,325 Supersite.st.80.jar
08/18/2005  03:46  PM     28,451 Supersiteender.html
08/29/2005  08:14  PM      4,913 Supersiteender.java
08/29/2005  08:14  PM      1,878 Supersite.lic
08/23/2005  04:25  PM      1,174 Supersite.lib
08/23/2005  04:25  PM      1,174 Supersite
8 File(s)   547,427 Bytes
2 Directories Free
```

General Electric

General Electric Company (GE) is an American multinational conglomerate founded in 1892, and incorporated in New York state and headquartered in Boston.



General protection fault

A general protection fault (GPF) in the x86 instruction set architectures (ISAs) is a fault (a type of interrupt) initiated by ISA-defined protection mechanisms in response to an access violation caused by some running code, either in the kernel or a user program. The mechanism is first described in Intel manuals and datasheets for the Intel 80286 CPU, which was introduced in 1983; it is also described in section 9.8.13 in the Intel 80386 programmer's reference manual from 1986. A general protection fault is implemented as an interrupt (vector number 13 (0Dh)). Some operating systems may also classify some exceptions not related to access violations, such as illegal opcode exceptions, as general protection faults, even though they have nothing to do with memory protection. If a CPU detects a protection violation, it stops executing the code and sends a GPF interrupt. In most cases, the operating system removes the failing process from the execution queue, signals the user, and continues executing other processes. If, however, the operating system fails to catch the general protection fault, i.e. another protection violation occurs before the operating system returns from the previous GPF interrupt, the CPU signals a double fault, stopping the operating system. If yet another failure (triple fault) occurs, the CPU is unable to recover; since 80286, the CPU enters a special halt state called "Shutdown", which can only be exited through a hardware reset. The IBM PC AT, the first PC-compatible system to contain an 80286, has hardware that detects the Shutdown state and automatically resets the CPU when it occurs. All descendants of the PC AT do the same, so in a PC, a triple fault causes an immediate system reset.



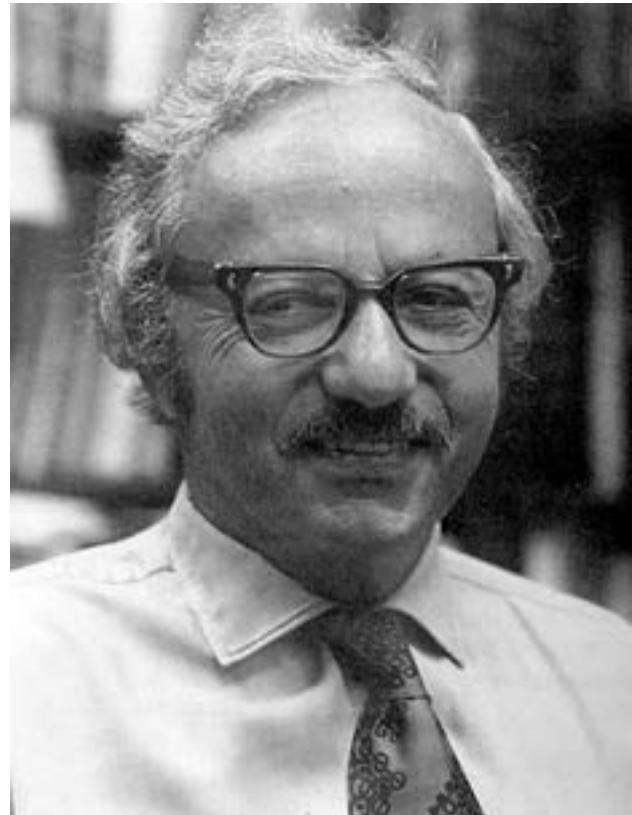
Geographic information system

A geographic information system (GIS) consists of integrated computer hardware and software that store, manage, analyze, edit, output, and visualize geographic data. Much of this often happens within a spatial database, however, this is not essential to meet the definition of a GIS. In a broader sense, one may consider such a system also to include human users and support staff, procedures and workflows, the body of knowledge of relevant concepts and methods, and institutional organizations.



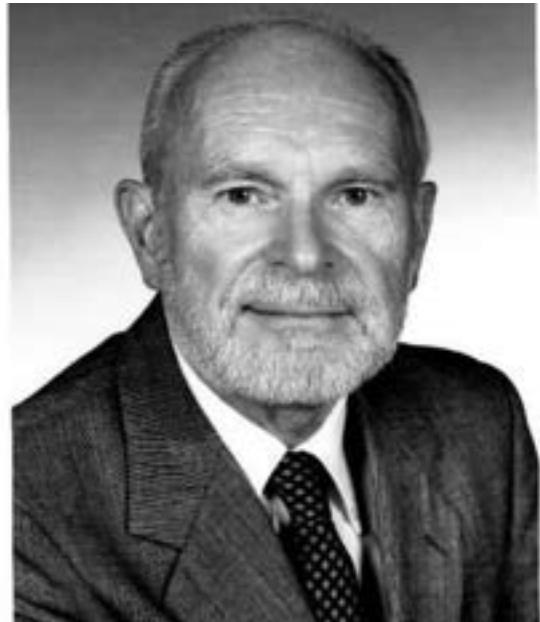
George Dantzig

George Bernard Dantzig (; November 8, 1914 ? May 13, 2005) was an American mathematical scientist who made contributions to industrial engineering, operations research, computer science, economics, and statistics.



George Klir

George Ji?◆ Klir (April 22, 1932 ? May 27, 2016) was a Czech-American computer scientist and professor of systems sciences at Binghamton University in Binghamton, New York.



Glossary of operating systems terms

This page is a glossary of Operating systems terminology.

Heat and Sensor Technology® Glossary	
bill of material:	list naming for the total costing price of the order as per design sheet.
3 phase voltage:	three-phase voltage.
4th voltage:	Phase phase voltage.
5th phase delta:	A connection type for the ceramic heater. The contacts are connected between the three positive and negative wires.
ASME:	american society for testing and materials, is an international standard organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.
balance payable:	amount of money that the company owes to supplier for goods and services. The money is referred to liability on the balance sheet. The accounts payable department receives money from customers for outstanding payments.
balance receivable:	the amount of money paid by the customer for goods or services when the invoices have been sent. This money is recorded as asset on the balance sheet. The accounts receivable department creates and sends invoices and receives and processes incoming payments.
billet:	A metal made up of two or more metal elements to give it greater strength and resistance to corrosion. Because alloy can loss of elasticity, may also referred to as impact metals. Examples are nickel, bronze, copper, and tin.
blank side:	This refers to the side of substrate in a surrounding environment. That an insulating material is present, and away from direct sources of pollution.
amps:	The amount of current passing through the wire. The amp rating in a heater is affected by the wire, turns, length, and pitch. Amps are not measured directly on the heater but can be calculated on the computer and compared to the requirement on the design sheet if the input or final user reading is too high.
amps per turn:	The calculation of amps for each coil in the heater. This value and total amps are specified on the design sheet.
brazing:	The process of heating, melting metal to a high temperature, then cooling it down so its permanent shape into a defined article.
bright annealing:	The annealing process creates a more oxidizing atmosphere, resulting in a smooth metallic finish. The process must be repeated.
burner:	A rough, non-flexible metal covering for the fuel valve. It is used for nozzle.
burner assembly:	The operation in which the core, metal, and other materials are put together. For this in a furnace, assembly follows the prepping operation. After assembly, the furnace are shaped.
burner clip:	A cylindrical set with the leads. The burner clip is used with a clip-on unshielded electrode to connect the two ends of a heater. The clip is cut-through the clip and then connected into the burner lead.
burner tube:	A long heater that contains one or more burners. These burners can be either forged, cast, or machined.
burner:	The basic rubber housing that is placed between the draft and the clamp on the thermocouple.
bushing:	A small ring that helps to attach the burner to the cartridge burner. The bush is welded to the ring, and the ring is then welded to the burner. For O-rings, the bush is welded to the outside of the ring. An O-rings ring, the bush is welded to the inside of the ring.
burr:	A machine used to create 'V' and 'U' beads on the long edge of the closure.

Google

Google LLC ((listen)) is an American multinational technology company focusing on online advertising, search engine technology, cloud computing, computer software, quantum computing, e-commerce, artificial intelligence, and consumer electronics. It has been referred to as "the most powerful company in the world" and one of the world's most valuable brands due to its market dominance, data collection, and technological advantages in the area of artificial intelligence. Its parent company Alphabet is considered one of the Big Five American information technology companies, alongside Amazon, Apple, Meta, and Microsoft.



Government of the United States

The federal government of the United States (U.S. federal government or U.S. government) is the national government of the United States, a federal republic located primarily in North America, composed of 50 states, a city within a federal district (the city of Washington in the District of Columbia, where most of the federal government is based), five major self-governing territories and several island possessions. The federal government, sometimes simply referred to as

Washington, is composed of three distinct branches: legislative, executive, and judicial, whose powers are vested by the U.S. Constitution in the Congress, the president and the federal courts, respectively. The powers and duties of these branches are further defined by acts of Congress, including the creation of executive departments and courts inferior to the Supreme Court.



Graphical user interface

The GUI (JEE-yoo-EYE or GOO-ee), graphical user interface, is a form of user interface that allows users to interact with electronic devices through graphical icons and audio indicator such as primary notation, instead of text-based UIs, typed command labels or text navigation. GUIs were introduced in reaction to the perceived steep learning curve of CLIs (command-line interfaces), which require commands to be typed on a computer keyboard.



Graphics processing unit

A graphics processing unit (GPU) is a specialized electronic circuit designed to manipulate and alter memory to accelerate the creation of images in a frame buffer intended for output to a display device. GPUs are used in embedded systems, mobile phones, personal computers, workstations, and game consoles.



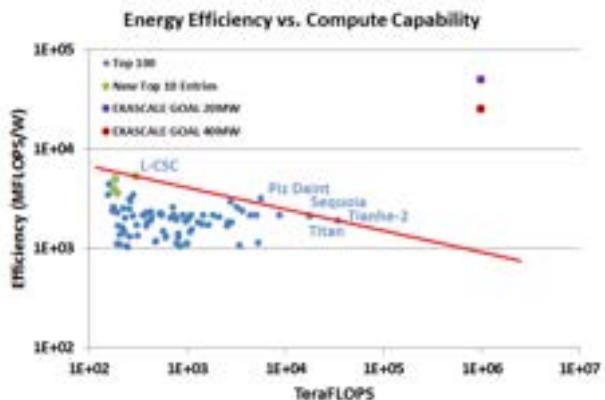
Green computing

Green computing, green IT, or ICT sustainability, is the study and practice of environmentally sustainable computing or IT.



Green500

The Green500 is a biannual ranking of supercomputers, from the TOP500 list of supercomputers, in terms of energy efficiency. The list measures performance per watt using the TOP500 measure of high performance LINPACK benchmarks at double-precision floating-point format.



Gregory Bateson

Gregory Bateson (9 May 1904 ? 4 July 1980) was an English anthropologist, social scientist, linguist, visual anthropologist, semiotician, and cyberneticist whose work intersected that of many other fields. His writings include *Steps to an Ecology of Mind* (1972) and *Mind and Nature* (1979).



HP-UX

HP-UX (from

HP-UX (from "Hewlett Packard Unix") is Hewlett Packard Enterprise's proprietary implementation of the Unix operating system, based on Unix System V (initially System III) and first released in 1984. Current versions support HPE Integrity Servers, based on Intel's Itanium architecture.

Haiku (operating system)

Haiku is a free and open-source operating system capable of running applications written for the now-discontinued BeOS. Its development began in 2001, and the operating system became self-hosting in 2008. The first alpha release was made in September 2009, and the last was November 2012; the first beta was released in September 2018, followed by beta 2 in June 2020, then beta 3 in July 2021. The fourth beta was released on December 23, 2022, still keeping BeOS 5 compatibility in its x86 32-bit images, with much increased number of modern drivers, GTK3 apps and Wine ported, as well as Xlib (X11) and Wayland compatibility layers. Haiku is supported by Haiku, Inc., a non-profit organization based in Rochester, New York, United States, founded in 2003 by former project leader Michael Phipps. During the most recent release cycle, Haiku, Inc. employed a developer.



Hard disk drive

A hard disk drive (HDD), hard disk, hard drive, or fixed disk, is an electro-mechanical data storage device that stores and retrieves digital data using magnetic storage with one or more rigid rapidly rotating platters coated with magnetic material. The platters are paired with magnetic heads, usually arranged on a moving actuator arm, which read and write data to the platter surfaces. Data is accessed in a random-access manner, meaning that individual blocks of data can be stored and retrieved in any order. HDDs are a type of non-volatile storage, retaining stored data when powered off. Modern HDDs are typically in the form of a small rectangular box.



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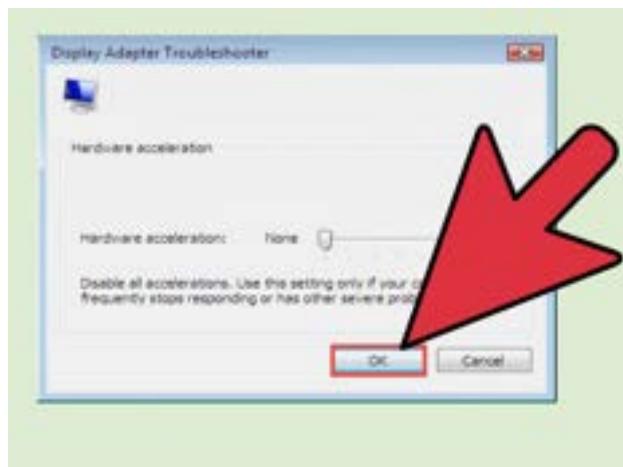


Hardware abstraction

Hardware abstractions are sets of routines in software that provide programs with access to hardware resources through programming interfaces. The programming interface allows all devices in a particular class C of hardware devices to be accessed through identical interfaces even though C may contain different subclasses of devices that each provide a different hardware interface.

Hardware acceleration

Hardware acceleration is the use of computer hardware designed to perform specific functions more efficiently when compared to software running on a general-purpose central processing unit (CPU). Any transformation of data that can be calculated in software running on a generic CPU can also be calculated in custom-made hardware, or in some mix of both.



Health informatics

Health informatics is the field of science and engineering that aims at developing methods and technologies for the acquisition, processing, and study of patient data, which can come from different sources and modalities, such as electronic health records, diagnostic test results, medical scans. The health domain provides an extremely wide variety of problems that can be tackled using computational techniques. Health informatics is a spectrum of multidisciplinary fields that includes study of the design, development and application of computational innovations to improve health care. The disciplines involved combines medicine fields with computing fields, in particular computer engineering, software engineering, information engineering, bioinformatics, bio-inspired computing, theoretical computer science, information systems, data science, information technology, autonomic computing, and behavior informatics. In academic institutions, medical informatics research focus on applications of artificial intelligence in healthcare and designing medical devices based on embedded systems. In some countries term informatics is also used in the context of applying library science to data management in hospitals.



Heinz von Foerster

Heinz von Foerster (German spelling: Heinz von Förster; November 13, 1911 – October 2, 2002) was an Austrian American scientist combining physics and philosophy, and widely attributed as the originator of Second-order cybernetics. He was twice a Guggenheim fellow (1956?57 and 1963?64) and also was a fellow of the American Association for the Advancement of Science, 1980. He is well known for his 1960 Doomsday equation formula published in Science predicting future population growth. As a polymath, he wrote nearly two hundred professional papers, gaining renown in fields from computer science and artificial intelligence to epistemology, and researched high-speed electronics and electro-optics switching devices as a physicist, and in biophysics, the study of memory and knowledge. He worked on cognition based on neurophysiology, mathematics, and philosophy and was called "one of the most consequential thinkers in the history of cybernetics". He came to the United States, and stayed after meeting with Warren Sturgis McCulloch, where he received funding from The Pentagon to establish the Biological Computer Laboratory, which built the first parallel computer, the Numa-Rete. Working with William Ross Ashby, one of the original Ratio Club members, and together with Warren McCulloch, Norbert Wiener, John von Neumann and Lawrence J. Fogel, Heinz von Foerster was an architect of cybernetics and one of the members of the Macy conferences, eventually becoming editor of its early proceedings alongside Hans-Lukas Teuber and Margaret Mead.



Hexadecimal

In mathematics and computing, the hexadecimal (also base-16 or simply hex) numeral system is a positional numeral system that represents numbers using a radix (base) of 16. Unlike the decimal system representing numbers using 10 symbols, hexadecimal uses 16 distinct symbols, most often the symbols "0"?"9" to represent values 0 to 9, and "A"?"F" (or alternatively "a"?"f") to represent values from 10 to 15.

DECIMAL	HEX	BINARY
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

History of IBM mainframe operating systems

The history of IBM mainframe operating systems is significant within the history of mainframe operating systems, because of IBM's long-standing position as the world's largest hardware supplier of mainframe computers. IBM mainframes run operating systems supplied by IBM and by third parties.



History of operating systems

Computer operating systems (OSes) provide a set of functions needed and used by most application programs on a computer, and the links needed to control and synchronize computer hardware. On the first computers, with no operating system, every program needed the full hardware specification to run correctly and perform standard tasks, and its own drivers for peripheral devices like printers and punched paper card readers. The growing complexity of hardware and application programs eventually made operating systems a necessity for everyday use.



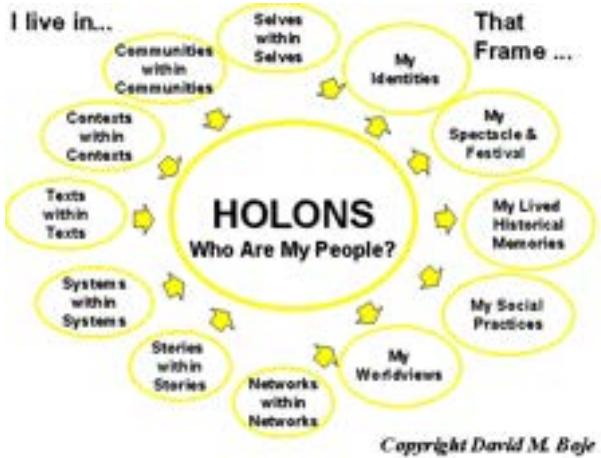
Hobbyist operating system

The development of a hobbyist operating system is one of the more involved and technical options for a computer hobbyist.



Holon (philosophy)

A holon (Greek: ?????, from ?????, *holos*, 'whole' and -??, -on, 'part') is something that is simultaneously a whole in and of itself, as well as a part of a larger whole. In other words, holons can be understood as the constituent part-wholes of a hierarchy. The holon represents a way to overcome the dichotomy between parts and wholes, as well as a way to account for both the self-assertive and the integrative tendencies of organisms. The term was coined by Arthur Koestler in *The Ghost in the Machine* (1967). In Koestler's formulations, a holon is something that has integrity and identity while simultaneously being a part of a larger system; it is a subsystem of a greater system. Holons are sometimes discussed in the context of self-organizing holarchic open (SOHO) systems.



Copyright David M. Boje

Homebrew Computer Club

The Homebrew Computer Club was an early computer hobbyist group in Menlo Park, California, which met from March 1975 to December 1986. The club had an influential role in the development of the microcomputer revolution and the rise of that aspect of the Silicon Valley information technology industrial complex.



Honeywell

Honeywell International Inc. is an American publicly traded, multinational conglomerate corporation headquartered in Charlotte, North Carolina. It primarily operates in four areas of business: aerospace, building technologies, performance materials and technologies (PMT), and safety and productivity solutions (SPS). Honeywell is a Fortune 100 company, ranked 94th in 2021. In 2022 the corporation had a global workforce of approximately 97,000 employees, down from 113,000 in 2019. The current chairman and chief executive officer (CEO) is Darius Adamczyk. The corporation's current name, Honeywell International Inc., is a product of the merger of Honeywell Inc. and AlliedSignal in 1999. The corporation headquarters were consolidated with AlliedSignal's headquarters in Morristown, New Jersey; however, the combined company chose the name "Honeywell" because of the considerable brand recognition. Honeywell was a component of the Dow Jones Industrial Average index from 1999 to 2008. Prior to 1999, its corporate predecessors were included dating back to 1925, including early entrants in the computing and thermostat industries. In 2020, Honeywell rejoined the Dow Jones Industrial Average index and the following year moved its stock listing from the New York Stock Exchange to the Nasdaq.

The Honeywell logo consists of the word "Honeywell" in a bold, red, sans-serif font. The letters are all uppercase and have a slightly rounded appearance.

Howard T. Odum

Howard Thomas Odum (September 1, 1924 – September 11, 2002), usually cited as H. T. Odum, was an American ecologist. He is known for his pioneering work on ecosystem ecology, and for his provocative proposals for additional laws of thermodynamics, informed by his work on general systems theory.



Human body

The human body is the structure of a human being. It is composed of many different types of cells that together create tissues and subsequently organ systems. They ensure homeostasis and the viability of the human body.



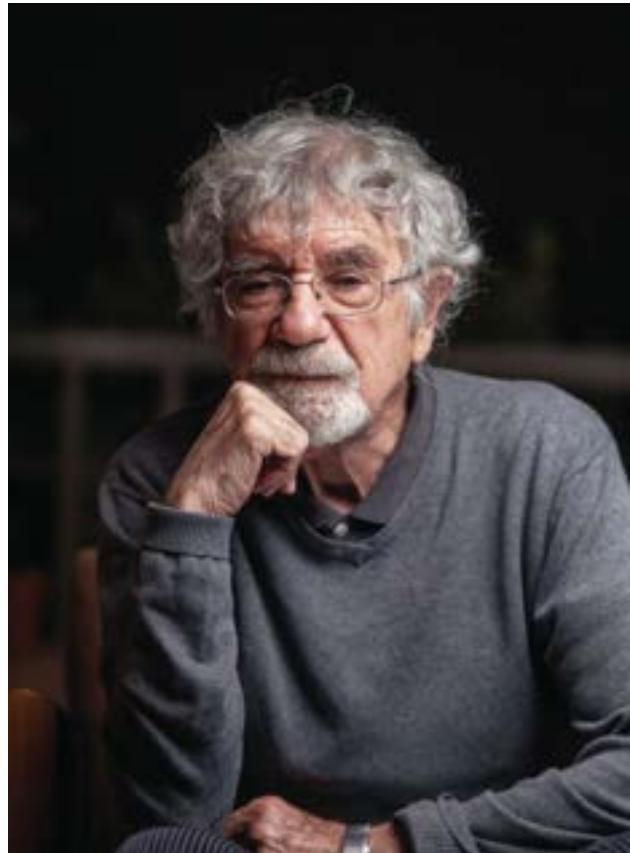
Human-computer interaction

Human-computer interaction (HCI) is research in the design and the use of computer technology, which focuses on the interfaces between people (users) and computers. HCI researchers observe the ways humans interact with computers and design technologies that allow humans to interact with computers in novel ways. A device that allows interaction between human being and a computer is known as a "Human-computer Interface (HCI)".



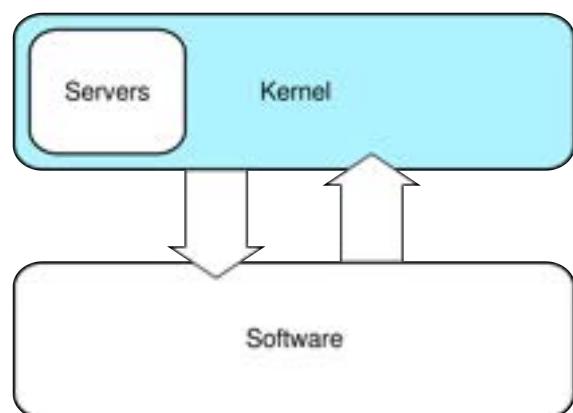
Humberto Maturana

Humberto Maturana Romesquino (September 14, 1928 – May 6, 2021) was a Chilean biologist and philosopher. Many consider him a member of a group of second-order cybernetics theoreticians such as Heinz von Foerster, Gordon Pask, Herbert Brun and Ernst von Glaserfeld.



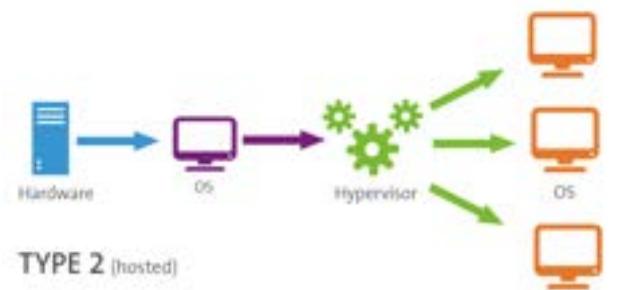
Hybrid kernel

A hybrid kernel is an operating system kernel architecture that attempts to combine aspects and benefits of microkernel and monolithic kernel architectures used in computer operating systems.



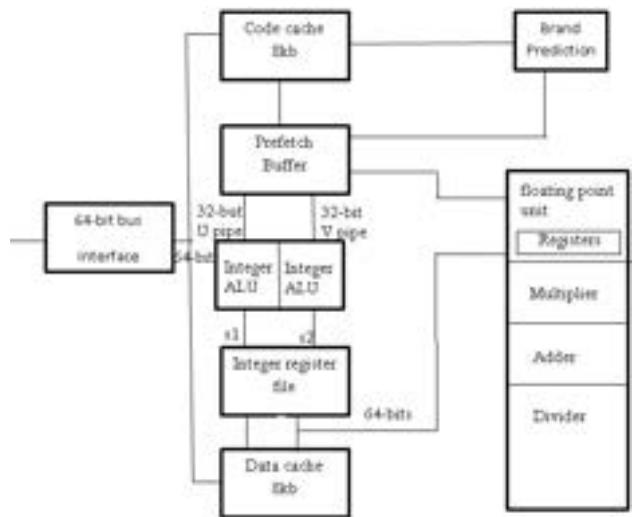
Hypervisor

A hypervisor (also known as a virtual machine monitor, VMM, or virtualizer) is a type of computer software, firmware or hardware that creates and runs virtual machines. A computer on which a hypervisor runs one or more virtual machines is called a host machine, and each virtual machine is called a guest machine. The hypervisor presents the guest operating systems with a virtual operating platform and manages the execution of the guest operating systems. Unlike an emulator, the guest executes most instructions on the native hardware. Multiple instances of a variety of operating systems may share the virtualized hardware resources: for example, Linux, Windows, and macOS instances can all run on a single physical x86 machine. This contrasts with operating-system-level virtualization, where all instances (usually called containers) must share a single kernel, though the guest operating systems can differ in user space, such as different Linux distributions with the same kernel.



IA-32

IA-32 (short for "Intel Architecture, 32-bit", commonly called i386) is the 32-bit version of the x86 instruction set architecture, designed by Intel and first implemented in the 80386 microprocessor in 1985. IA-32 is the first incarnation of x86 that supports 32-bit computing; as a result, the "IA-32" term may be used as a metonym to refer to all x86 versions that support 32-bit computing. Within various programming language directives, IA-32 is still sometimes referred to as the "i386" architecture. In some other contexts, certain iterations of the IA-32 ISA are sometimes labelled i486, i586 and i686, referring to the instruction supersets offered by the 80486, the P5 and the P6 microarchitectures respectively. These updates offered numerous additions alongside the base IA-32 set including floating-point capabilities and the MMX extensions.



IBM

The International Business Machines Corporation (IBM), nicknamed Big Blue, is an American multinational technology corporation headquartered in Armonk, New York and present in over 175 countries. It specializes in computer hardware, middleware, and software, and provides hosting and consulting services in areas ranging from mainframe computers to nanotechnology. IBM is the largest industrial research organization in the world, with 19 research facilities across a dozen countries, and has held the record for most annual U.S. patents generated by a business for 29 consecutive years from 1993 to 2021. IBM was founded in 1911 as the Computing-Tabulating-Recording Company (CTR), a holding company of manufacturers of record-keeping and measuring systems. It was renamed "International Business Machines" in 1924 and soon became the leading manufacturer of punch-card tabulating systems. For the next several decades, IBM would become an industry leader in several emerging technologies, including electric typewriters, electromechanical calculators, and personal computers. During the 1960s and 1970s, the IBM mainframe, exemplified by the System/360, was the dominant computing platform, and the company produced 80 percent of computers in the U.S. and 70 percent of computers worldwide. After pioneering the multipurpose microcomputer in the 1980s, which set the standard for personal computers, IBM began losing its market dominance to emerging competitors. Beginning in the 1990s, the company began downsizing its operations and divesting from commodity production, most notably selling its personal computer division to the Lenovo Group in 2005. IBM has since concentrated on computer services, software, supercomputers, and scientific research.



IBM 1410

The IBM 1410, a member of the IBM 1400 series, was a decimal computer with variable word length that was announced by IBM on September 12, 1960 and marketed as a midrange business computer. It was withdrawn on March 30, 1970.



IBM 7010

The IBM 700/7000 series is a series of large-scale (mainframe) computer systems that were made by IBM through the 1950s and early 1960s. The series includes several different, incompatible processor architectures. The 700s use vacuum-tube logic and were made obsolete by the introduction of the transistorized 7000s. The 7000s, in turn, were eventually replaced with System/360, which was announced in 1964. However the 360/65, the first 360 powerful enough to replace 7000s, did not become available until November 1965. Early problems with OS/360 and the high cost of converting software kept many 7000s in service for years afterward.



IBM 704

The IBM 704 is a large digital mainframe computer introduced by IBM in 1954. It was the first mass-produced computer with hardware for floating-point arithmetic. The IBM 704 Manual of operation states:



IBM 7040

The IBM 7040 was a historic but short-lived model of transistor computer built in the 1960s.



IBM 709

The IBM 709 was a computer system, initially announced by IBM in January 1957 and first installed during August 1958. The 709 was an improved version of its predecessor, the IBM 704, and was the third of the IBM 700/7000 series of scientific computers. The improvements included overlapped input/output, indirect addressing, and three "convert" instructions which provided support for decimal arithmetic, leading zero suppression, and several other operations. The 709 had 32,768 words of 36-bit magnetic core memory and could execute 42,000 add or subtract instructions per second. It could multiply two 36-bit integers at a rate of 5000 per second. An optional hardware emulator executed old IBM 704 programs on the IBM 709. This was the first commercially available emulator. Registers and most 704 instructions were emulated in 709 hardware. Complex 704 instructions such as floating point trap and input-output routines were emulated in 709 software.



IBM 7090

The IBM 7090 is a second-generation transistorized version of the earlier IBM 709 vacuum tube mainframe computer that was designed for "large-scale scientific and technological applications". The 7090 is the fourth member of the IBM 700/7000 series scientific computers. The first 7090 installation was in December 1959. In 1960, a typical system sold for \$2.9 million (equivalent to \$21 million in 2021) or could be rented for \$63,500 a month (equivalent to \$452,000 in 2021).



IBM 7090/94 IBSYS

IBSYS is the discontinued tape-based operating system that IBM supplied with its IBM 709, IBM 7090 and IBM 7094 computers. A similar operating system (but with several significant differences), also called IBSYS, was provided with IBM 7040 and IBM 7044 computers. IBSYS was based on FORTRAN Monitor System (FMS) and (more likely) Bell Labs' "BESYS" rather than the SHARE Operating System.



IBM AIX

AIX (Advanced Interactive eXecutive, pronounced , "ay-eye-ex") is a series of proprietary Unix operating systems developed and sold by IBM for several of its computer platforms.



IBM Airline Control Program

IBM Airline Control Program, or ACP, is a discontinued operating system developed by IBM beginning about 1965. In contrast to previous airline transaction processing systems, the most notable aspect of ACP is that it was designed to run on most models of the IBM System/360 mainframe computer family. This departed from the earlier model in which each airline had a different, machine-specific transaction system.



IBM Personal Computer

The IBM Personal Computer (model 5150, commonly known as the IBM PC) is the first microcomputer released in the IBM PC model line and the basis for the IBM PC compatible de facto standard. Released on August 12, 1981, it was created by a team of engineers and designers directed by Don Estridge in Boca Raton, Florida.



IBM Power Systems

IBM Power Systems is a family of server computers from IBM that are based on its Power processors. It was created in 2008 as a merger of the System p and System i product lines.



IBM System/360

The IBM System/360 (S/360) is a family of mainframe computer systems that was announced by IBM on April 7, 1964, and delivered between 1965 and 1978. It was the first family of computers designed to cover both commercial and scientific applications and to cover a complete range of applications from small to large. The design distinguished between architecture and implementation, allowing IBM to release a suite of compatible designs at different prices. All but the only partially compatible Model 44 and the most expensive systems use microcode to implement the instruction set, which features 8-bit byte addressing and binary, decimal, and hexadecimal floating-point calculations.



IBM System/360 Model 67

The IBM System/360 Model 67 (S/360-67) was an important IBM mainframe model in the late 1960s. Unlike the rest of the S/360 series, it included features to facilitate time-sharing applications, notably a Dynamic Address Translation unit, the "DAT box", to support virtual memory, 32-bit addressing and the 2846 Channel Controller to allow sharing channels between processors. The S/360-67 was otherwise compatible with the rest of the S/360 series.



IBM i

IBM i (the i standing for integrated) is an operating system developed by IBM for IBM Power Systems. It was originally released in 1988 as OS/400, as the sole operating system of the IBM AS/400 line of systems. It was renamed to i5/OS in 2004, before being renamed a second time to IBM i in 2008. It is an evolution of the System/38 CPF operating system, with compatibility layers for System/36 SSP and AIX applications. It inherits a number of distinctive features from the System/38 platform, including the Machine Interface, the implementation of object-based addressing on top of a single-level store, and the tight integration of a relational database into the operating system.



INT (x86 instruction)

INT is an assembly language instruction for x86 processors that generates a software interrupt. It takes the interrupt number formatted as a byte value. When written in assembly language, the instruction is written like this:



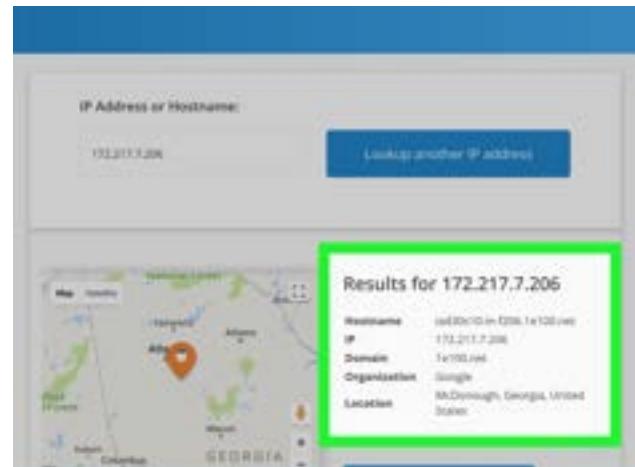
iOS

iOS (formerly iPhone OS) is a mobile operating system developed by Apple Inc. exclusively for its hardware. It is the operating system that powers many of the company's mobile devices, including the iPhone; the term also includes the system software for iPads predating iPadOS?which was introduced in 2019?as well as on the iPod Touch devices?which were discontinued in mid-2022. It is the world's second-most widely installed mobile operating system, after Android. It is the basis for three other operating systems made by Apple: iPadOS, tvOS, and watchOS. It is proprietary software, although some parts of it are open source under the Apple Public Source License and other licenses. Unveiled in 2007 for the first-generation iPhone, iOS has since been extended to support other Apple devices such as the iPod Touch (September 2007) and the iPad (introduced: January 2010; availability: April 2010.) As of March 2018, Apple's App Store contains more than 2.1 million iOS applications, 1 million of which are native for iPads. These mobile apps have collectively been downloaded more than 130 billion times.



IP address

An Internet Protocol address (IP address) is a numerical label such as 192.0.2.1 that is connected to a computer network that uses the Internet Protocol for communication. An IP address serves two main functions: network interface identification and location addressing.



ISBN (identifier)

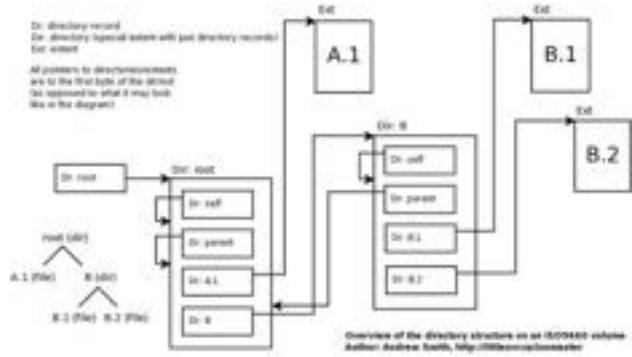
The International Standard Book Number (ISBN) is a numeric commercial book identifier that is intended to be unique. Publishers purchase or receive ISBNs from an affiliate of the International ISBN Agency. An ISBN is assigned to each separate edition and variation (except reprintings) of a publication. For example, an e-book, a paperback and a hardcover edition of the same book will each have a different ISBN. The ISBN is ten digits long if assigned before 2007, and thirteen digits long if assigned on or after 1 January 2007. The method of assigning an ISBN is nation-specific and varies between countries, often depending on how large the publishing industry is within a country.

ISBN 978-3-16-148410-0



ISO 9660

ISO 9660 (also known as ECMA-119) is a file system for optical disc media. The file system is an international standard available from the International Organization for Standardization (ISO). Since the specification is available for anybody to purchase, implementations have been written for many operating systems.



Ilya Prigogine

Viscount Ilya Romanovich Prigogine (; Russian: Илья Романович Пржогин; 25 January [O.S. 12 January] 1917 – 28 May 2003) was a Russian-born Belgian physical chemist and Nobel laureate noted for his work on dissipative structures, complex systems, and irreversibility.



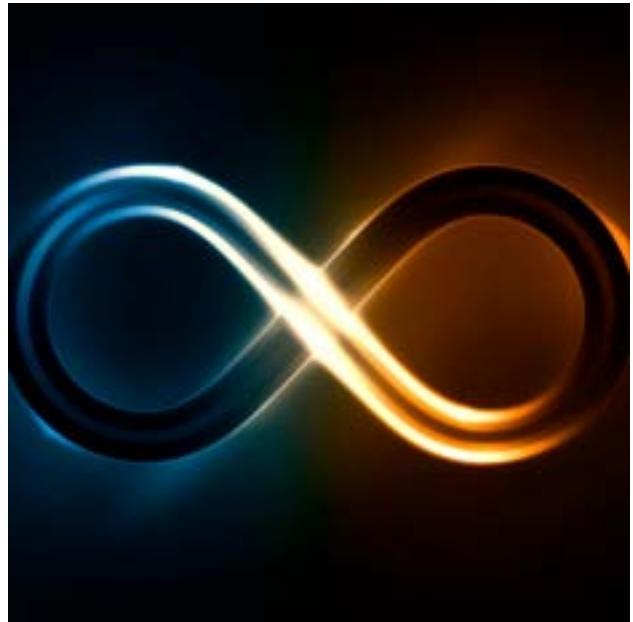
Image compression

Image compression is a type of data compression applied to digital images, to reduce their cost for storage or transmission. Algorithms may take advantage of visual perception and the statistical properties of image data to provide superior results compared with generic data compression methods which are used for other digital data.



Infinite loop

In computer programming, an infinite loop (or endless loop) is a sequence of instructions that, as written, will continue endlessly, unless an external intervention occurs ("pull the plug"). It may be intentional.



Information retrieval

Information retrieval (IR) in computing and information science is the process of obtaining information system resources that are relevant to an information need from a collection of those resources. Searches can be based on full-text or other content-based indexing. Information retrieval is the science of searching for information in a document, searching for documents themselves, and also searching for the metadata that describes data, and for databases of texts, images or sounds.



Information security

Information security, sometimes shortened to InfoSec, is the practice of protecting information by mitigating information risks. It is part of information risk management. It typically involves preventing or reducing the probability of unauthorized/inappropriate access to data, or the unlawful use, disclosure, disruption, deletion, corruption, modification, inspection, recording, or devaluation of information. It also involves actions intended to reduce the adverse impacts of such incidents. Protected information may take any form, e.g. electronic or physical, tangible (e.g. paperwork) or intangible (e.g. knowledge). Information security's primary focus is the balanced protection of the confidentiality, integrity, and availability of data (also known as the CIA triad) while maintaining a focus on efficient policy implementation, all without hampering organization productivity. This is largely achieved through a structured risk management process that involves:



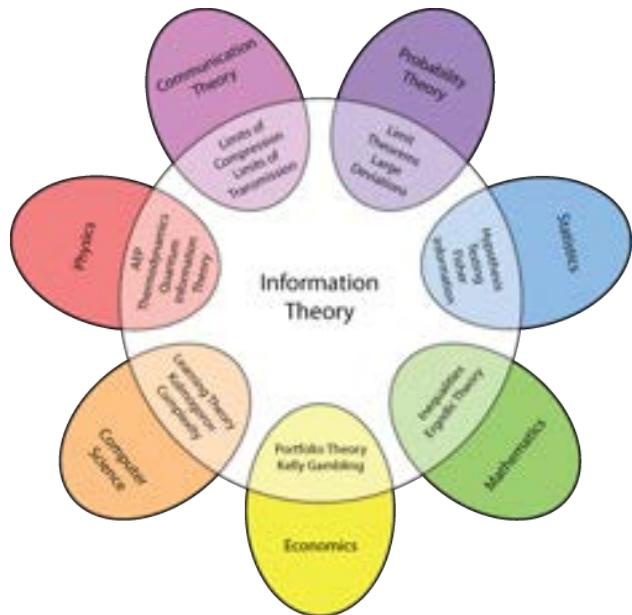
Information system

An information system (IS) is a formal, sociotechnical, organizational system designed to collect, process, store, and distribute information. From a sociotechnical perspective, information systems are composed by four components: task, people, structure (or roles), and technology. Information systems can be defined as an integration of components for collection, storage and processing of data of which the data is used to provide information, contribute to knowledge as well as digital products that facilitate decision making. A computer information system is a system that is composed of people and computers that processes or interprets information. The term is also sometimes used to simply refer to a computer system with software installed.



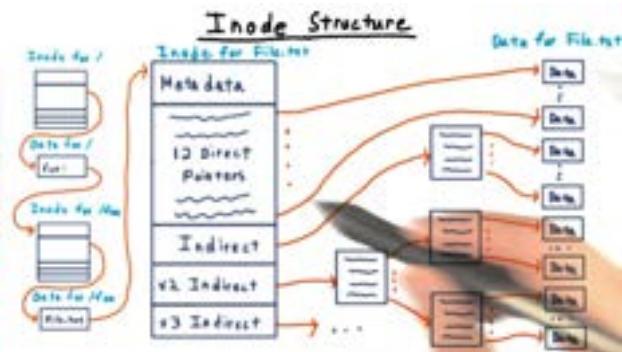
Information theory

Information theory is the scientific study of the quantification, storage, and communication of information. The field was originally established by the works of Harry Nyquist and Ralph Hartley, in the 1920s, and Claude Shannon in the 1940s.^{vii} The field is at the intersection of probability theory, statistics, computer science, statistical mechanics, information engineering, and electrical engineering.



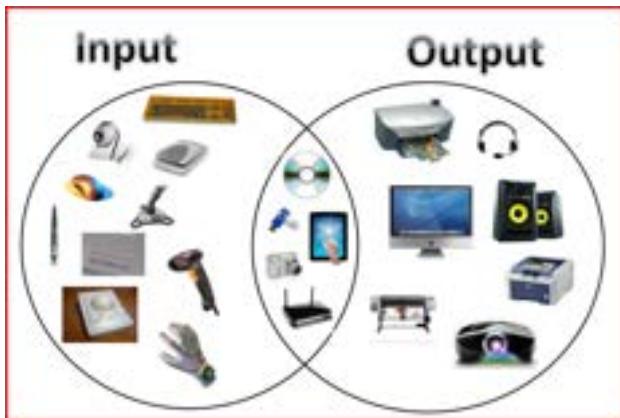
Inode

The inode (index node) is a data structure in a Unix-style file system that describes a file-system object such as a file or a directory. Each inode stores the attributes and disk block locations of the object's data. File-system object attributes may include metadata (times of last change, access, modification), as well as owner and permission data. A directory is a list of inodes with their assigned names. The list includes an entry for itself, its parent, and each of its children.



Input and output

In computing, input/output (I/O, i/o, or informally io or IO) is the communication between an information processing system, such as a computer, and the outside world, possibly a human or another information processing system. Inputs are the signals or data received by the system and outputs are the signals or data sent from it. The term can also be used as part of an action; to "perform I/O" is to perform an input or output operation.



Input device

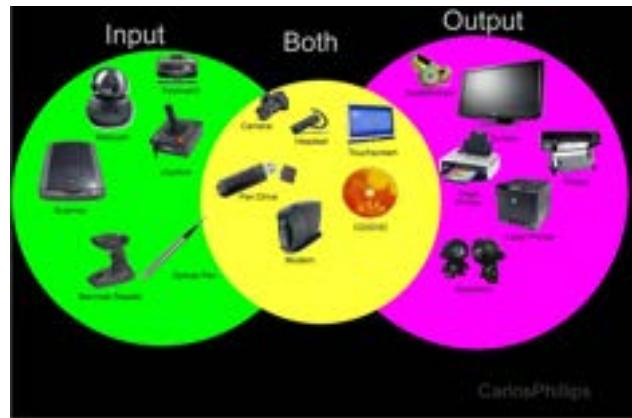
In computing, an input device is a piece of equipment used to provide data and control signals to an information processing system, such as a computer or information appliance. Examples of input devices include keyboards, mouse, scanners, cameras, joysticks, and microphones.

Input Devices of Computer



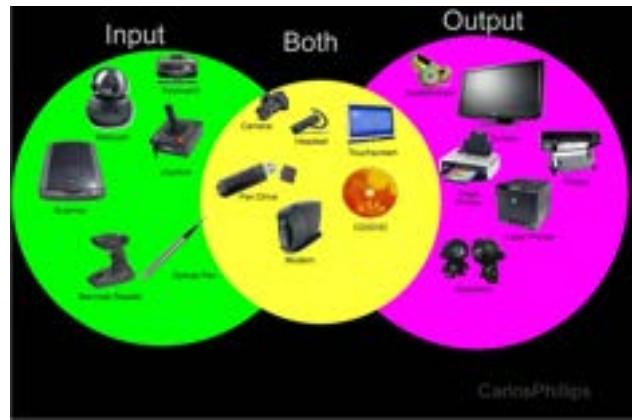
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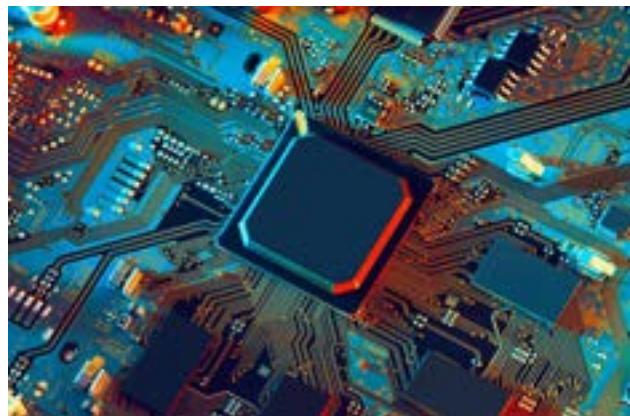
Institution of Engineering and Technology

The Institution of Engineering and Technology (IET) is a multidisciplinary professional engineering institution. The IET was formed in 2006 from two separate institutions: the Institution of Electrical Engineers (IEE), dating back to 1871, and the Institution of Incorporated Engineers (IIE) dating back to 1884. Its worldwide membership is currently in excess of 158,000 in 153 countries. The IET's main offices are in Savoy Place in London, England, and at Michael Faraday House in Stevenage, England.



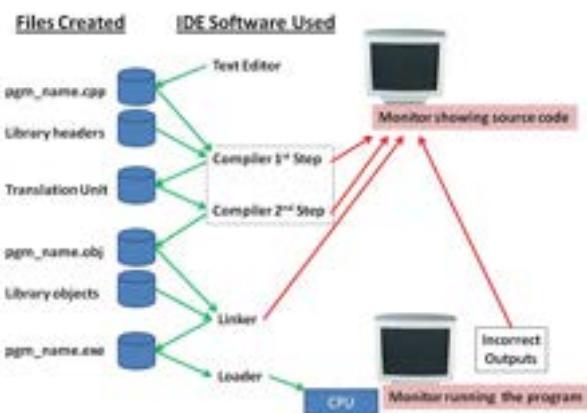
Integrated circuit

An integrated circuit or monolithic integrated circuit (also referred to as an IC, a chip, or a microchip) is a set of electronic circuits on one small flat piece (or "chip") of semiconductor material, usually silicon. Large numbers of miniaturized transistors and other electronic components are integrated together on the chip. This results in circuits that are orders of magnitude smaller, faster, and less expensive than those constructed of discrete components, allowing a large transistor count. The IC's mass production capability, reliability, and building-block approach to integrated circuit design has ensured the rapid adoption of standardized ICs in place of designs using discrete transistors. ICs are now used in virtually all electronic equipment and have revolutionized the world of electronics. Computers, mobile phones and other home appliances are now inextricable parts of the structure of modern societies, made possible by the small size and low cost of ICs such as modern computer processors and microcontrollers.



Integrated development environment

An integrated development environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development. An IDE normally consists of at least a source code editor, build automation tools, and a debugger. Some IDEs, such as NetBeans and Eclipse, contain the necessary compiler, interpreter, or both; others, such as SharpDevelop and Lazarus, do not.



Intel 80386

The Intel 386, originally released as 80386 and later renamed i386, is a 32-bit microprocessor introduced in 1985. The first versions had 275,000 transistors and were the CPU of many workstations and high-end personal computers of the time. As the original implementation of the 32-bit extension of the 80286 architecture, the i386 instruction set, programming model, and binary encodings are still the common denominator for all 32-bit x86 processors, which is termed the i386 architecture, x86, or IA-32, depending on context.



Intel Corporation

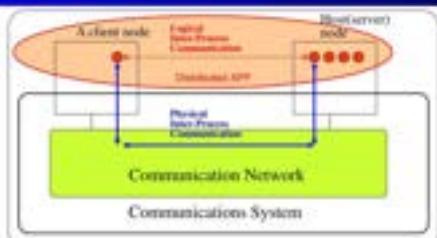
Intel Corporation (commonly known as Intel) is an American multinational corporation and technology company headquartered in Santa Clara, California. It is the world's largest semiconductor chip manufacturer by revenue, and is one of the developers of the x86 series of instruction sets, the instruction sets found in most personal computers (PCs). Incorporated in Delaware, Intel ranked No. 45 in the 2020 Fortune 500 list of the largest United States corporations by total revenue for nearly a decade, from 2007 to 2016 fiscal years. Intel supplies microprocessors for computer system manufacturers such as Acer, Lenovo, HP, and Dell. Intel also manufactures motherboard chipsets, network interface controllers and integrated circuits, flash memory, graphics chips, embedded processors and other devices related to communications and computing.



Inter-process communication

In computer science, inter-process communication or interprocess communication (IPC) refers specifically to the mechanisms an operating system provides to allow the processes to manage shared data. Typically, applications can use IPC, categorized as clients and servers, where the client requests data and the server responds to client requests. Many applications are both clients and servers, as commonly seen in distributed computing.

Inter-process communication ctd



Possibly several processes on each host (use ports),
Send and receive primitives.



Interaction design

Interaction design, often abbreviated as IxD, is "the practice of designing interactive digital products, environments, systems, and services."^{xxvii, 30} Beyond the digital aspect, interaction design is also useful when creating physical (non-digital) products, exploring how a user might interact with it. Common topics of interaction design include design, human-computer interaction, and software development. While interaction design has an interest in form (similar to other design fields), its main area of focus rests on behavior.^{xxvii, 30} Rather than analyzing how things are, interaction design synthesizes and imagines things as they could be. This element of interaction design is what characterizes IxD as a design field as opposed to a science or engineering field. While disciplines such as software engineering have a heavy focus on designing for technical stakeholders, interaction design is focused on meeting the needs and optimizing the experience of users, within relevant technical or business constraints.^{xviii}



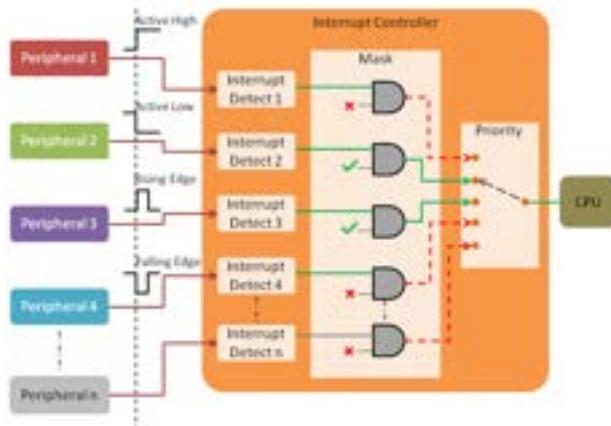
Interpreter (computing)

In computer science, an interpreter is a computer program that directly executes instructions written in a programming or scripting language, without requiring them previously to have been compiled into a machine language program. An interpreter generally uses one of the following strategies for program execution:



Interrupt

In digital computers, an interrupt (sometimes referred to as a trap) is a request for the processor to interrupt currently executing code (when permitted), so that the event can be processed in a timely manner. If the request is accepted, the processor will suspend its current activities, save its state, and execute a function called an interrupt handler (or an interrupt service routine, ISR) to deal with the event. This interruption is often temporary, allowing the software to resume normal activities after the interrupt handler finishes, although the interrupt could instead indicate a fatal error. Interrupts are commonly used by hardware devices to indicate electronic or physical state changes that require time-sensitive attention. Interrupts are also commonly used to implement computer multitasking, especially in real-time computing. Systems that use interrupts in these ways are said to be interrupt-driven.



Interrupt handler

In computer systems programming, an interrupt handler, also known as an interrupt service routine or ISR, is a special block of code associated with a specific interrupt condition. Interrupt handlers are initiated by hardware interrupts, software interrupt instructions, or software exceptions, and are used for implementing device drivers or transitions between protected modes of operation, such as system calls.

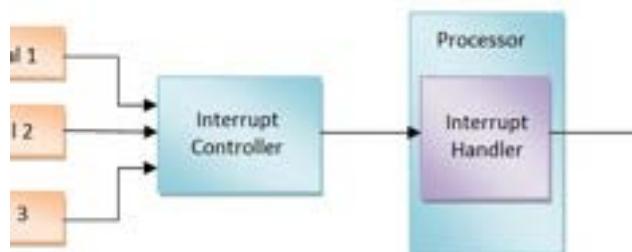


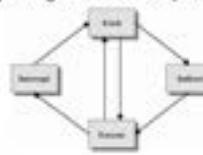
fig: interrupt Handler

Interrupt request (PC architecture)

In a computer, an interrupt request (or IRQ) is a hardware signal sent to the processor that temporarily stops a running program and allows a special program, an interrupt handler, to run instead. Hardware interrupts are used to handle events such as receiving data from a modem or network card, key presses, or mouse movements.

Interrupts

An interrupt works by adding an additional step to the fetch execute cycle.



If the processor finds that an interrupt has occurred then it will stop whatever it's doing and deal with it using the **interrupt service routine (ISR)**. This is essentially just copying current register contents to the system stack and completing the interrupt. Once finished it will retrieve the

Interrupt vector table

An interrupt vector table (IVT) is a data structure that associates a list of interrupt handlers with a list of interrupt requests in a table of interrupt vectors. Each entry of the interrupt vector table, called an interrupt vector, is the address of an interrupt handler. While the concept is common across processor architectures, IVTs may be implemented in architecture-specific fashions. For example, a dispatch table is one method of implementing an interrupt vector table.

Exception number	IRQ number	Offset	Vector
16+n	n	0x0040+4n	IRQn
18	2	0x004C	IRQ2
17	1	0x0048	IRQ1
16	0	0x0044	IRQ0
15	-1	0x0040	Systick
14	-2	0x003C	PendSV
13		0x0038	Reserved
12			Reserved for Debug
11	-5	0x002C	SVCall
10			Reserved
9			
8			
7			
6	-10	0x0018	Usage fault
5	-11	0x0014	Bus fault
4	-12	0x0010	Memory management fault
3	-13	0x000C	Hand fault
2	-14	0x0008	NMI
1		0x0004	Reset
		0x0000	Initial SP value

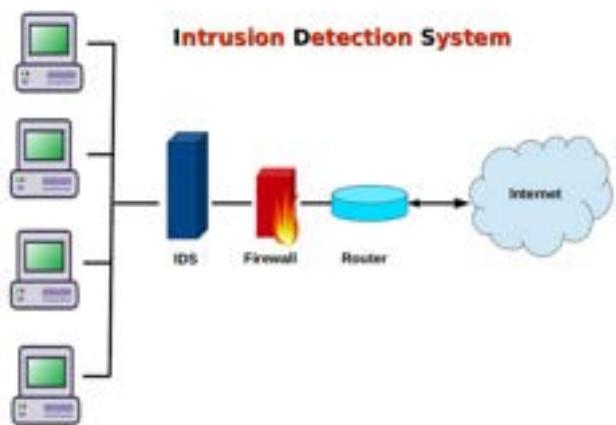
Interruptible operating system

An interruptible operating system is an operating system with ability to handle multiple interrupts concurrently, or in other words, which allow interrupts to be interrupted.



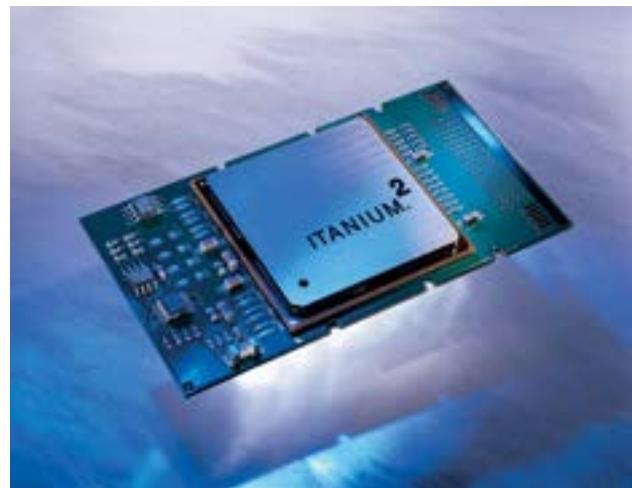
Intrusion detection system

An intrusion detection system (IDS; also intrusion prevention system or IPS) is a device or software application that monitors a network or systems for malicious activity or policy violations. Any intrusion activity or violation is typically reported either to an administrator or collected centrally using a security information and event management (SIEM) system. A SIEM system combines outputs from multiple sources and uses alarm filtering techniques to distinguish malicious activity from false alarms. IDS types range in scope from single computers to large networks. The most common classifications are network intrusion detection systems (NIDS) and host-based intrusion detection systems (HIDS). A system that monitors important operating system files is an example of an HIDS, while a system that analyzes incoming network traffic is an example of an NIDS. It is also possible to classify IDS by detection approach. The most well-known variants are signature-based detection (recognizing bad patterns, such as malware) and anomaly-based detection (detecting deviations from a model of "good" traffic, which often relies on machine learning). Another common variant is reputation-based detection (recognizing the potential threat according to the reputation scores). Some IDS products have the ability to respond to detected intrusions. Systems with response capabilities are typically referred to as an intrusion prevention system. Intrusion detection systems can also serve specific purposes by augmenting them with custom tools, such as using a honeypot to attract and characterize malicious traffic.



Itanium

Itanium (eye-TAY-nee-?m) is a discontinued family of 64-bit Intel microprocessors that implement the Intel Itanium architecture (formerly called IA-64). Launched in June 2001, Intel marketed the processors for enterprise servers and high-performance computing systems. The Itanium architecture originated at Hewlett-Packard (HP), and was later jointly developed by HP and Intel.



James Grier Miller

James Grier Miller (1916 ? 7 November 2002, California) was an American biologist, a pioneer of systems science and academic administrator, who originated the modern use of the term "behavioral science", founded and directed the multi-disciplinary Mental Health Research Institute at the University of Michigan, and originated the living systems theory.



James J. Kay

James J. Kay (June 18, 1954 ? May 30, 2004) was an ecological scientist and policy-maker. He was a respected physicist best known for his theoretical work on complexity and thermodynamics.



Java (software platform)

Java is a set of computer software and specifications developed by James Gosling at Sun Microsystems, which was later acquired by the Oracle Corporation, that provides a system for developing application software and deploying it in a cross-platform computing environment. Java is used in a wide variety of computing platforms from embedded devices and mobile phones to enterprise servers and supercomputers. Java applets, which are less common than standalone Java applications, were commonly run in secure, sandboxed environments to provide many features of native applications through being embedded in HTML pages.



Jay Wright Forrester

Jay Wright Forrester (July 14, 1918 – November 16, 2016) was a pioneering American computer engineer and systems scientist. He is credited with being one of the inventors of magnetic core memory, the predominant form of random-access computer memory during the most explosive years of digital computer development (between 1955 and 1975). It was part of a family of related technologies which bridged the gap between vacuum tubes and semiconductors by exploiting the magnetic properties of materials to perform switching and amplification.



Jennifer Wilby

Jennifer M. Wilby (born 1953) is an American and UK management scientist, and past director of the Centre for Systems Studies, and a senior lecturer and researcher in management systems and sciences in The Business School, University of Hull. She served as president of the International Society for the Systems Sciences for the term 2010?2011.



John Seddon

John Seddon is a British occupational psychologist and author, specialising in change in the service industry. He is the managing director of Vanguard, a consultancy company he formed in 1985 and the inventor of 'The Vanguard Method'. Vanguard currently operates in eleven countries. Seddon is a visiting professor at Buckingham University Business School.



John Wiley & Sons

John Wiley & Sons, Inc., commonly known as Wiley (), is an American multinational publishing company founded in 1807 that focuses on academic publishing and instructional materials. The company produces books, journals, and encyclopedias, in print and electronically, as well as online products and services, training materials, and educational materials for undergraduate, graduate, and continuing education students.



Journaling file system

A journaling file system is a file system that keeps track of changes not yet committed to the file system's main part by recording the goal of such changes in a data structure known as a "journal", which is usually a circular log. In the event of a system crash or power failure, such file systems can be brought back online more quickly with a lower likelihood of becoming corrupted. Depending on the actual implementation, a journaling file system may only keep track of stored metadata, resulting in improved performance at the expense of increased possibility for data corruption. Alternatively, a journaling file system may track both stored data and related metadata, while some implementations allow selectable behavior in this regard.



Just enough operating system

Just enough operating system (JeOS, pronounced "juice" according to SUSE) is a paradigm for customizing operating systems to fit the needs of a particular application such as for a software appliance. The platform only includes the operating system components required to support a particular application and any other third-party components contained in the appliance (e.g., the kernel). This makes the appliance smaller, faster (to boot and to execute the particular application) and potentially more secure than an application running under a full general-purpose OS.

★ JeOS (Just Enough Operating System)



- » Just enough OS that's ready-to-run
 - Minimal components for a small size
 - Designed specifically for virtualization and cloud environments
 - Saves deployment and configuration
- » Save time with no need to re-certify
 - JeOS is based on the same code base as SUSE Linux Enterprise Server
 - Enterprise grade for mission-critical applications
- » SUSE Linux Enterprise Server JeOS is also delivered as KIWI template for easy large scale configuration management

★ New

Jörg Gutknecht

Jörg Gutknecht (born 3 January 1949 in Bülach) is a Swiss computer scientist. He developed, with Niklaus Wirth, the programming language Oberon and the corresponding operating system Oberon.



KDE

KDE is an international free software community that develops free and open-source software. As a central development hub, it provides tools and resources that allow collaborative work on this kind of software. Well-known products include the Plasma Desktop (the default desktop environment on many Linux distributions), KDE Frameworks, and a range of cross-platform applications such as Amarok, digiKam, and Krita that are designed to run on Unix and Unix-like operating systems, Microsoft Windows, and Android.



KDE Plasma 5

KDE Plasma 5 is the fifth and current generation of the graphical workspaces environment created by KDE primarily for Linux systems. KDE Plasma 5 is the successor of KDE Plasma 4 and was first released on 15 July 2014. It includes a new default theme, known as "Breeze", as well as increased convergence across different devices. The graphical interface was fully migrated to QML, which uses OpenGL for hardware acceleration, which resulted in better performance and reduced power consumption. Plasma Mobile is a Plasma 5 variant for Linux-based smartphones.



Kathleen Carley

Kathleen M. Carley is an American computational social scientist specializing in dynamic network analysis. She is a professor in the School of Computer Science in the Carnegie Mellon Institute for Software Research at Carnegie Mellon University and also holds appointments in the Tepper School of Business, the Heinz College, the Department of Engineering and Public Policy, and the Department of Social and Decision Sciences.



Katia Sycara

Ekaterini Panagiotou Sycara (Greek: Εκατερίνη Παναγιώτου Σύκαρα) is a Greek computer scientist. She is an Edward Fredkin Research Professor of Robotics in the Robotics Institute, School of Computer Science at Carnegie Mellon University internationally known for her research in artificial intelligence, particularly in the fields of negotiation, autonomous agents and multi-agent systems. She directs the Advanced Agent-Robotics Technology Lab at Robotics Institute, Carnegie Mellon University. She also serves as academic advisor for PhD students at both Robotics Institute and Tepper School of Business.



Keith Bostic (software engineer)

Keith Bostic is an American software engineer and one of the key people in the history of Berkeley Software Distribution (BSD) Unix and open-source software.



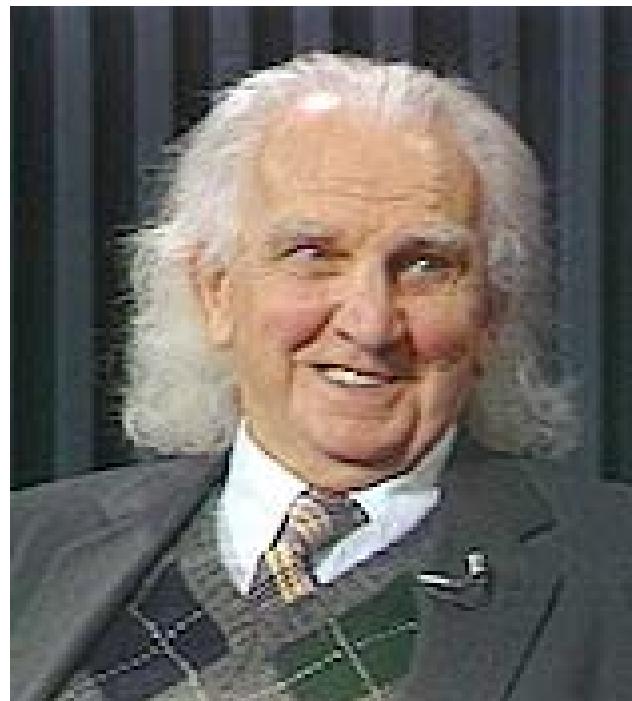
Ken Thompson

Kenneth Lane Thompson (born February 4, 1943) is an American pioneer of computer science. Thompson worked at Bell Labs for most of his career where he designed and implemented the original Unix operating system. He also invented the B programming language, the direct predecessor to the C programming language, and was one of the creators and early developers of the Plan 9 operating system. Since 2006, Thompson has worked at Google, where he co-developed the Go programming language.



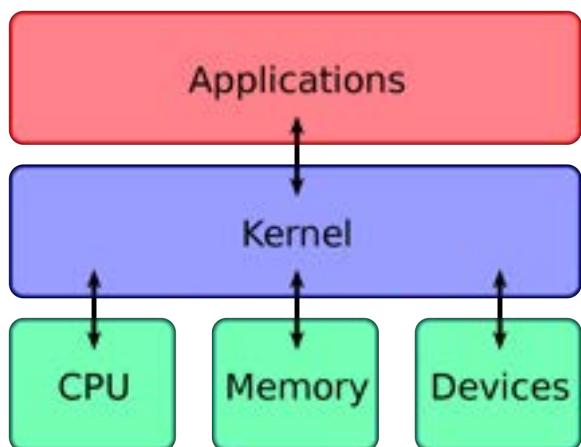
Kenneth E. Boulding

Kenneth Ewart Boulding (; January 18, 1910 – March 18, 1993) was an English-born American economist, educator, peace activist, and interdisciplinary philosopher. Boulding was the author of two citation classics: *The Image: Knowledge in Life and Society* (1956) and *Conflict and Defense: A General Theory* (1962). He was co-founder of general systems theory and founder of numerous ongoing intellectual projects in economics and social science. He was married to sociologist Elise M. Boulding.



Kernel (operating system)

The kernel is a computer program at the core of a computer's operating system and generally has complete control over everything in the system. It is the portion of the operating system code that is always resident in memory and facilitates interactions between hardware and software components. A full kernel controls all hardware resources (e.g. I/O, memory, cryptography) via device drivers, arbitrates conflicts between processes concerning such resources, and optimizes the utilization of common resources e.g. CPU & cache usage, file systems, and network sockets. On most systems, the kernel is one of the first programs loaded on startup (after the bootloader). It handles the rest of startup as well as memory, peripherals, and input/output (I/O) requests from software, translating them into data-processing instructions for the central processing unit.



Kevin Warwick

Kevin Warwick (born 9 February 1954) is an English engineer and Deputy Vice-Chancellor (Research) at Coventry University. He is known for his studies on direct interfaces between computer systems and the human nervous system, and has also done research concerning robotics.



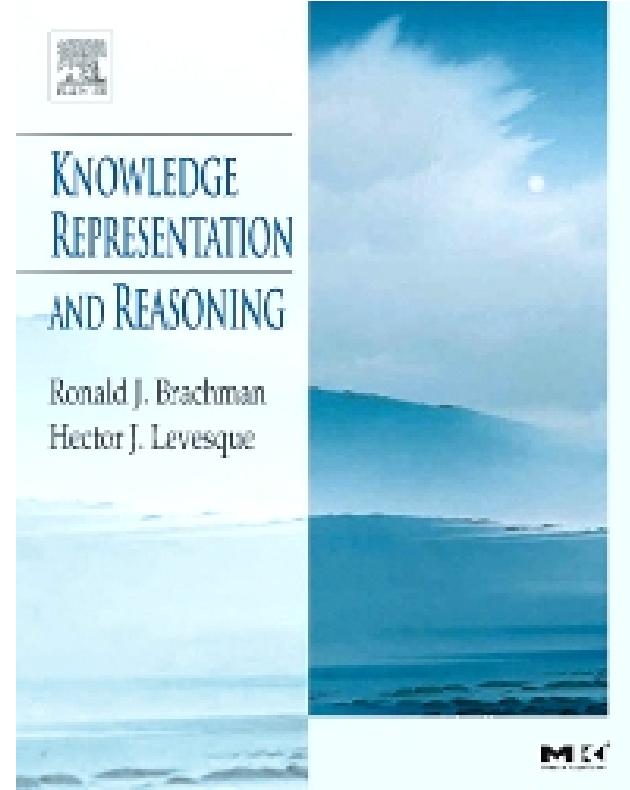
Keyboard (computing)

A computer keyboard is a peripheral input device modeled after the typewriter keyboard which uses an arrangement of buttons or keys to act as mechanical levers or electronic switches. Replacing early punched cards and paper tape technology, interaction via teleprinter-style keyboards have been the main input method for computers since the 1970s, supplemented by the computer mouse since the 1980s.



Knowledge representation and reasoning

Knowledge representation and reasoning (KRR, KR&R, KR \bowtie) is the field of artificial intelligence (AI) dedicated to representing information about the world in a form that a computer system can use to solve complex tasks such as diagnosing a medical condition or having a dialog in a natural language. Knowledge representation incorporates findings from psychology about how humans solve problems and represent knowledge in order to design formalisms that will make complex systems easier to design and build. Knowledge representation and reasoning also incorporates findings from logic to automate various kinds of reasoning, such as the application of rules or the relations of sets and subsets.



Library (computing)

In computer science, a library is a collection of non-volatile resources used by computer programs, often for software development. These may include configuration data, documentation, help data, message templates, pre-written code and subroutines, classes, values or type specifications. In IBM's OS/360 and its successors they are referred to as partitioned data sets. A library is also a collection of implementations of behavior, written in terms of a language, that has a well-defined interface by which the behavior is invoked. For instance, people who want to write a higher-level program can use a library to make system calls instead of implementing those system calls over and over again. In addition, the behavior is provided for reuse by multiple independent programs. A program invokes the library-provided behavior via a mechanism of the language. For example, in a simple imperative language such as C, the behavior in a library is invoked by using C's normal function-call. What distinguishes the call as being to a library function, versus being to another function in the same program, is the way that the code is organized in the system. Library code is organized in such a way that it can be used by multiple programs that have no connection to each other, while code that is part of a program is organized to be used only within that one program. This distinction can gain a hierarchical notion when a program grows large, such as a multi-million-line program. In that case, there may be internal libraries that are reused by independent sub-portions of the large program.



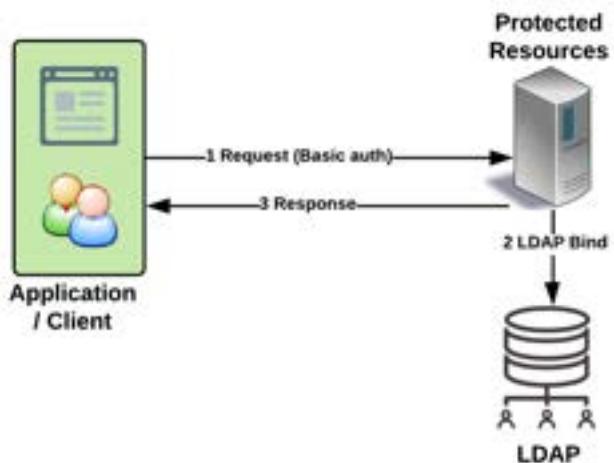
Light-weight Linux distribution

A light-weight Linux distribution is one that uses lower memory and/or has less processor-speed requirements than a more "feature-rich" Linux distribution. The lower demands on hardware ideally result in a more responsive machine, and/or allow devices with fewer system resources (e.g. older or embedded hardware) to be used productively. The lower memory and/or processor-speed requirements are achieved by avoiding software bloat, i.e. by leaving out features that are perceived to have little or no practical use or advantage, or for which there is no or low demand.



Lightweight Directory Access Protocol

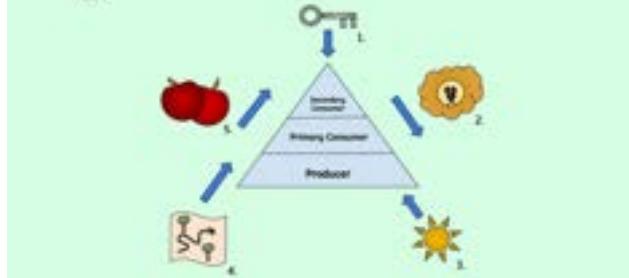
The Lightweight Directory Access Protocol (LDAP) is an open, vendor-neutral, industry standard application protocol for accessing and maintaining distributed directory information services over an Internet Protocol (IP) network. Directory services play an important role in developing intranet and Internet applications by allowing the sharing of information about users, systems, networks, services, and applications throughout the network. As examples, directory services may provide any organized set of records, often with a hierarchical structure, such as a corporate email directory. Similarly, a telephone directory is a list of subscribers with an address and a phone number.



Limiting factor

A limiting factor is a variable of a system that causes a noticeable change in output or another measure of a type of system. The limiting factor is in a pyramid shape of organisms going up from the producers to consumers and so on. A factor not limiting over a certain domain of starting conditions may yet be limiting over another domain of starting conditions, including that of the factor.

1. **Resources** - a top-down limiting factor that impacts the whole ecosystem structure
2. **Predation** - a top-down limiting factor of a trophic level from the higher trophic levels
3. **Energy** - a bottom-up limiting factor that affects the population of producers and in turn higher trophic levels
4. **Space** - a bottom-up limiting factor that impacts the maximum biomass an ecosystem can support in it's area
5. **Food Supply** - a bottom-up limiting factor impacting each trophic level from the trophic levels below



Linker (computing)

In computing, a linker or link editor is a computer system program that takes one or more object files (generated by a compiler or an assembler) and combines them into a single executable file, library file, or another "object" file.

Linus Torvalds

Linus Benedict Torvalds (LEE-n?z TOR-vawldz, Finland Swedish: [?li?n?s ?tu?rv?lds] (listen); born 28 December 1969) is a Finnish software engineer who is the creator and, historically, the lead developer of the Linux kernel, used by Linux distributions and other operating systems such as Android. He also created the distributed version control system Git.



Linux

Linux ((listen) LEE-nuks or LIN-uks) is a family of open-source Unix-like operating systems based on the Linux kernel, an operating system kernel first released on September 17, 1991, by Linus Torvalds. Linux is typically packaged as a Linux distribution, which includes the kernel and supporting system software and libraries, many of which are provided by the GNU Project. Many Linux distributions use the word "Linux" in their name, but the Free Software Foundation uses the name "GNU/Linux" to emphasize the importance of GNU software, causing some controversy. Popular Linux distributions include Debian, Fedora Linux, and Ubuntu, the latter of which itself consists of many different distributions and modifications, including Lubuntu and Xubuntu. Commercial distributions include Red Hat Enterprise Linux and SUSE Linux Enterprise. Desktop Linux distributions include a windowing system such as X11 or Wayland, and a desktop environment such as GNOME or KDE Plasma. Distributions intended for servers may omit graphics altogether, or include a solution stack such as LAMP. Because Linux is freely redistributable, anyone may create a distribution for any purpose. Linux was originally developed for personal computers based on the Intel x86 architecture, but has since been ported to more platforms than any other operating system. Because of the dominance of the Linux-based Android on smartphones, Linux, including Android, has the largest installed base of all general-purpose operating systems, as of May 2022. Although Linux is, as of November 2022, used by only around 2.6 percent of desktop computers, the Chromebook, which runs the Linux kernel-based ChromeOS, dominates the US K-12 education market and represents nearly 20 percent of sub-\$300 notebook sales in the US.



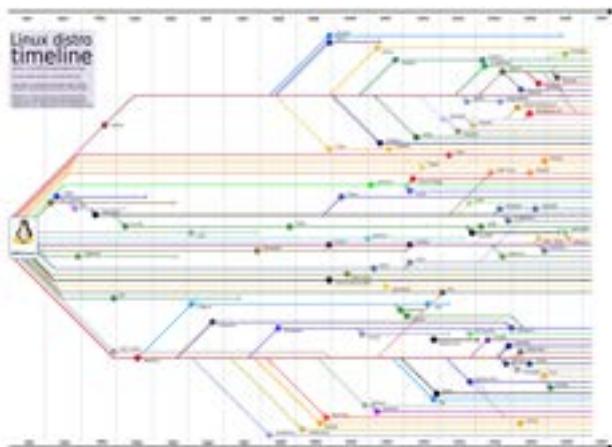
Linux Mint

Linux Mint is a community-driven Linux distribution based on Ubuntu (which is in turn based on Debian), bundled with a variety of free and open-source applications. It can provide full out-of-the-box multimedia support for those who choose to include proprietary software such as multimedia codecs. The Linux Mint project was created by Clément Lefèuvre and is actively maintained by the Linux Mint Team and community.



Linux distribution

A Linux distribution (often abbreviated as distro) is an operating system made from a software collection that includes the Linux kernel, and often a package management system. Linux users usually obtain their operating system by downloading one of the Linux distributions, which are available for a wide variety of systems ranging from embedded devices (for example, OpenWrt) and personal computers (for example, Linux Mint) to powerful supercomputers (for example, Rocks Cluster Distribution).



Linux kernel

The Linux kernel is a free and open-source, monolithic, modular, multitasking, Unix-like operating system kernel. It was originally authored in 1991 by Linus Torvalds for his i386-based PC, and it was soon adopted as the kernel for the GNU operating system, which was written to be a free (*libre*) replacement for Unix.

List of important publications in computer science

This is a list of important publications in computer science, organized by field. Some reasons why a particular publication might be regarded as important:

Volume 7, No.5, September - October 2018
ISSN: 2319-7789

International Journal of Information Systems and Computer Sciences
Available Online at <http://www.org.IJISM.Science/pdf/line/ijism75048.pdf>
<https://doi.org/10.38524/ijiscs.2018.0175048>



An Enhanced Text Mining Approach using Dynamic Programming

Dessouky Rafa Moustafa¹, Nourhan Yousaf Gamilandien², Hameemun Tauseef Iqbal³, Shukrullah Hussain Tariq⁴
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ABSTRACT:- Data mining is a persistent area of research in computer science. In this paper, we propose a new knowledgeable and useful estimation and pattern finding approach. It is widely applied to several areas of applications such as information retrieval, computational biology, and bio-informatics. This research has been a systematic study on text dataset matching. The main idea of this research is to find the best matching string resulting in used in finding all the occurrences of a given pattern P of length m from a given text T of length n, where m <= n. An occurrence of a pattern inside the text can

1. INTRODUCTION

One of the fundamental problems in information retrieval is searching for key information within large size text. These data are not yet in standard form and are usually in unstructured form which makes it difficult to handle [1]. The act of extracting meaningful knowledge or patterns from a large data set is commonly referred to as data mining. Data can be in the form of video, voice, image, document, or text [2].

Data mining in different areas of applications such as text mining, data processing, and signal processing [3], [4], information retrieval in the text database can be structured, semi-structured, or unstructured such as in the form of matrix, sparse matrix [5], [6], and binary encoding [7]–[9]. Data mining is the process of extracting useful information from a large amount of data [10].

String matching is used in finding the occurrences of a given pattern P in the given text T [10], [11]. Pattern matching can be considered as "deterministic" or "fuzzy" [12]. Some examples are exact pattern matching, approximate pattern matching, and online and offline searching used for medical matching [13]. In order to speed up the searching, there is a high scope for better algorithms [14]. Recently, the bi-combinative algorithm has been used to solve the string matching problem [15]. The total of algorithm takes advantage of high-speed processor.

The research proposes a framework for text mining using string matching and interpretation with the goal of addressing the problem of pattern and connector between words in textual documents,

simply. It is characterized as "exact" or "approximate". There is no general framework for text mining using a fast bi-combinative algorithm. The matching cost of sequences of a pattern needs a huge loads of texts. We evaluate the performance of these algorithms in the literature on different text and discuss their variability under different conditions.

KEYWORDS:- Algorithm, Bi-combinative, Text mining, String matching, Text mining

The rest of the paper is organized as follows. Section II presents a brief introduction. Section III and Section IV describes the methods, procedures, and results discussion respectively. Finally, Section V is to conclude and discusses the future work.

2. RELATED WORK

The major goals of homogenization mentioned are on the basis of [16], propose efficient ways of exchanging information such as documents, and electronic texts through World Wide Web servers [2], [3]. Generally, the search engines are used for the search engines to find the relevant information [17]. The search engines are used for the user to find the required information [18]. Text mining techniques are to help them [19]. Text mining techniques that are used in converting unstructured data into structured [1] knowledge discovery helps numerous areas of applications such as text querying, text mining, and machine learning [2], [10].

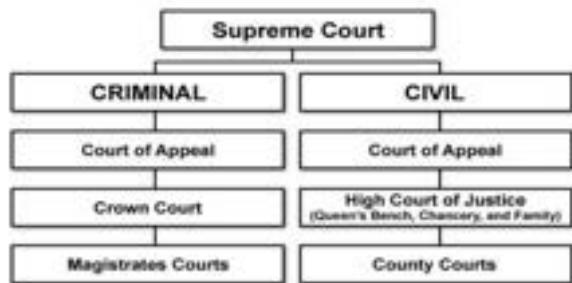
Pattern matching and retrieval of information is one of the basic principles of data mining such as chemical sensing methods [10]. The search engines using pattern matching is a very popular model application in various applications such as image matching, computational biology, and pattern matching generally using the two classes, exact and approximate matching [11], [12].

Exact and fuzzy [12] proposed a series of algorithms for pattern matching. In [20], proposed a bi-combinative approach. It finds a unique and exact sequence occurrence from the given DNA gene dataset using a genetic algorithm [21]. The algorithm for the problem is based on the concept of generating a primary key. If it has a non-redundant primary key of $O(n^2 \times k)$. Similarly, from [22] also presented a string matching algorithm [23]. We can use these patterns, and connectors to find the exact sequence of the target word of the given pattern which contains a free character set [24], [25], [26]. To make the problem more and more difficult to provide efficient solutions due to the volume of the dataset.

List of national legal systems

The contemporary national legal systems are generally based on one of four basic systems: civil law, common law, statutory law, religious law or combinations of these. However, the legal system of each country is shaped by its unique history and so incorporates individual variations. The science that studies law at the level of legal systems is called comparative law.

ENGLISH LEGAL SYSTEMS & STRUCTURE OF COURTS



List of operating systems

This is a list of operating systems. Computer operating systems can be categorized by technology, ownership, licensing, working state, usage, and by many other characteristics. In practice, many of these groupings may overlap. Criteria for inclusion is notability, as shown either through an existing Wikipedia article or citation to a reliable source.

Current release: Kodi v15.2 "Isengard"



List of pioneers in computer science

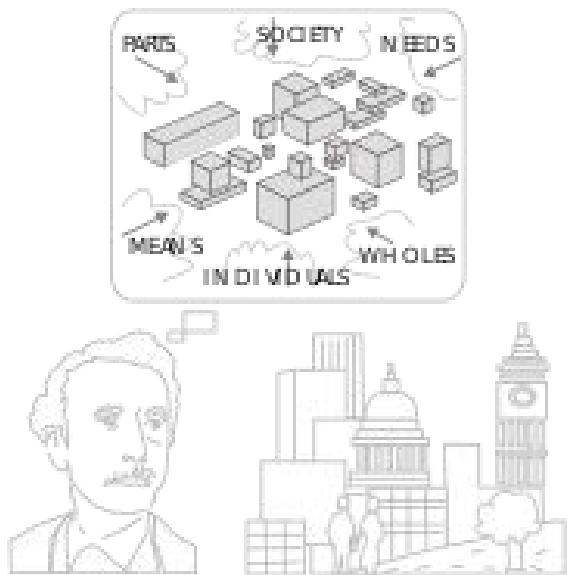
This is a list of people who made transformative breakthroughs in the creation, development and imagining of what computers could do.



List of systems sciences organizations

Systems science is the interdisciplinary field of science surrounding systems theory, cybernetics, the science of complex systems. It aims to develop interdisciplinary foundations, which are applicable in a variety of areas, such as engineering, biology, medicine and social sciences.

Systems science and systemics are names for all research related to systems theory. It is defined as an emerging branch of science that studies holistic systems and tries to develop logical, mathematical, engineering and philosophical paradigms and frameworks in which physical, technological, biological, social, cognitive and metaphysical systems can be studied and developed.



List of systems scientists

This is a list of systems scientists, people who made notable contributions in the field of the systems sciences:



PK Gupta



Hari B Hablani



Dinesh Varshnay



KK Pandey



MS Sodha



Pradeep Mathur



Ram Bilas Pachori



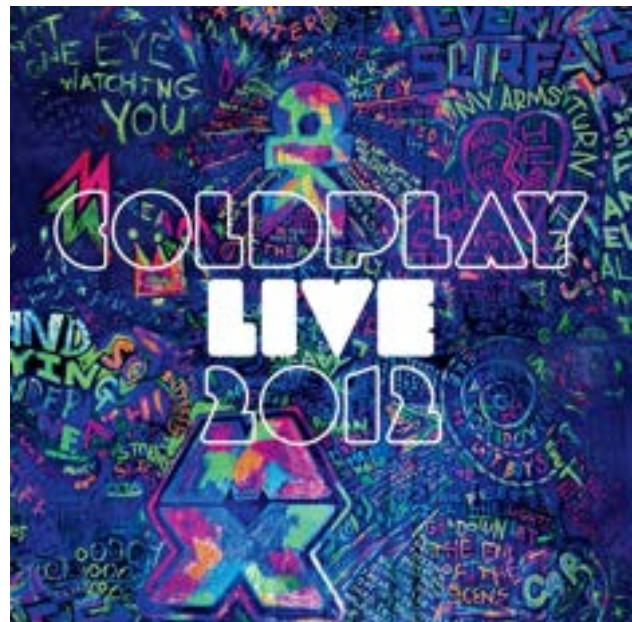
SC Koria



Sindhunil Barman Roy

Live CD

A live CD (also live DVD, live disc, or live operating system) is a complete bootable computer installation including operating system which runs directly from a CD-ROM or similar storage device into a computer's memory, rather than loading from a hard disk drive. A live CD allows users to run an operating system for any purpose without installing it or making any changes to the computer's configuration. Live CDs can run on a computer without secondary storage, such as a hard disk drive, or with a corrupted hard disk drive or file system, allowing data recovery.



Live USB

A live USB is a portable USB-attached external data storage device containing a full operating system that can be booted from. The term is reminiscent of USB flash drives but may encompass an external hard disk drive or solid-state drive, though they may be referred to as "live HDD" and "live SSD" respectively. They are the evolutionary next step after live CDs, but with the added benefit of writable storage, allowing customizations to the booted operating system. Live USBs can be used in embedded systems for system administration, data recovery, or test driving, and can persistently save settings and install software packages on the USB device.



Living systems

Living systems are open self-organizing life forms that interact with their environment. These systems are maintained by flows of information, energy and matter.



Loadable kernel module

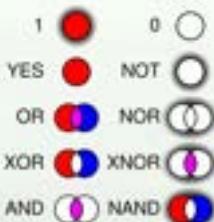
In computing, a loadable kernel module (LKM) is an object file that contains code to extend the running kernel, or so-called base kernel, of an operating system. LKMs are typically used to add support for new hardware (as device drivers) and/or filesystems, or for adding system calls. When the functionality provided by an LKM is no longer required, it can be unloaded in order to free memory and other resources.



Logic in computer science

Logic in computer science covers the overlap between the field of logic and that of computer science. The topic can essentially be divided into three main areas:

Logic in computer science



https://en.wikipedia.org/w/index.php?title=Logic_gates&oldid=9000000

Ludwig von Bertalanffy

Karl Ludwig von Bertalanffy (19 September 1901 – 12 June 1972) was an Austrian biologist known as one of the founders of general systems theory (GST). This is an interdisciplinary practice that describes systems with interacting components, applicable to biology, cybernetics and other fields. Bertalanffy proposed that the classical laws of thermodynamics might be applied to closed systems, but not necessarily to "open systems" such as living things. His mathematical model of an organism's growth over time, published in 1934, is still in use today.



Lydia Kavraki

Lydia E. Kavraki (Greek: Λυδία Καρβάκη) is a Greek-American computer scientist, the Noah Harding Professor of Computer Science, a professor of bioengineering, electrical and computer engineering, and mechanical engineering at Rice University. She is also the director of the Ken Kennedy Institute at Rice University. She is known for her work on robotics/AI and bioinformatics/computational biology and in particular for the probabilistic roadmap method for robot motion planning and biomolecular configuration analysis.



MCP (Burroughs Large Systems)

The MCP (Master Control Program) is the operating system of the Burroughs small, medium and large systems, including the Unisys Clearpath/MCP systems.



MCP/ClearPath

The MCP (Master Control Program) is the operating system of the Burroughs small, medium and large systems, including the Unisys Clearpath/MCP systems.



WHITE
PAPER

Unisys ClearPath MCP & OS 2200 Mainframes to the Google Cloud Platform Reference Architecture Guide

Astadia Mainframe-to-Cloud Modernization Series



MINIX

MINIX (from mini-Unix) is a Unix-like operating system based on a microkernel architecture. Since version 2.0, it has been Portable Operating System Interface (POSIX) compliant. Early versions of MINIX were created by Andrew S. Tanenbaum for educational purposes. Starting with MINIX 3, the primary aim of development shifted from education to the creation of a highly reliable and self-healing microkernel OS. MINIX 3 was developed as open-source software.



MIT

The Massachusetts Institute of Technology (MIT) is a private land-grant research university in Cambridge, Massachusetts. Established in 1861, MIT has played a key role in the development of modern technology and science, and is one of the most prestigious and highly ranked academic institutions in the world. Founded in response to the increasing industrialization of the United States, MIT adopted a European polytechnic university model and stressed laboratory instruction in applied science and engineering. MIT is one of three private land grant universities in the United States, the others being Cornell University and Tuskegee University. The institute has an urban campus that extends more than a mile (1.6 km) alongside the Charles River, and encompasses a number of major off-campus facilities such as the MIT Lincoln Laboratory, the Bates Center, and the Haystack Observatory, as well as affiliated laboratories such as the Broad and Whitehead Institutes.



MKS Inc.

MKS, Inc (formerly called Mortice Kern Systems) is a subsidiary of PTC, Inc. It was previously a multinational independent software vendor that was acquired by Parametric Technology Corporation (now PTC) on May 31, 2011. MKS operated in the Application Lifecycle Management (ALM) and Systems Administration market segments. Integrity, a PTC Product manages systems and software development processes and connects engineering artifacts, including requirements, models, code and test, ensuring comprehensive lifecycle traceability.

MOS Technology 6502

The MOS Technology 6502 (typically pronounced "sixty-five-oh-two" or "six-five-oh-two") is an 8-bit microprocessor that was designed by a small team led by Chuck Peddle for MOS Technology. The design team had formerly worked at Motorola on the Motorola 6800 project; the 6502 is essentially a simplified, less expensive and faster version of that design.



MS-DOS

MS-DOS (em-es-DOSS; acronym for Microsoft Disk Operating System, also known as Microsoft DOS) is an operating system for x86-based personal computers mostly developed by Microsoft. Collectively, MS-DOS, its rebranding as IBM PC DOS, and a few operating systems attempting to be compatible with MS-DOS, are sometimes referred to as "DOS" (which is also the generic acronym for disk operating system). MS-DOS was the main operating system for IBM PC compatibles during the 1980s, from which point it was gradually superseded by operating systems offering a graphical user interface (GUI), in various generations of the graphical Microsoft Windows operating system.

```
Current date is Tue 1-01-1980
Enter new date:
Current time is 21:35:24.18
Enter new time:

The IBM Personal Computer DOS
Version 2.00 (C)Copyright IBM Corp 1981, 1982, 1983

A>dir

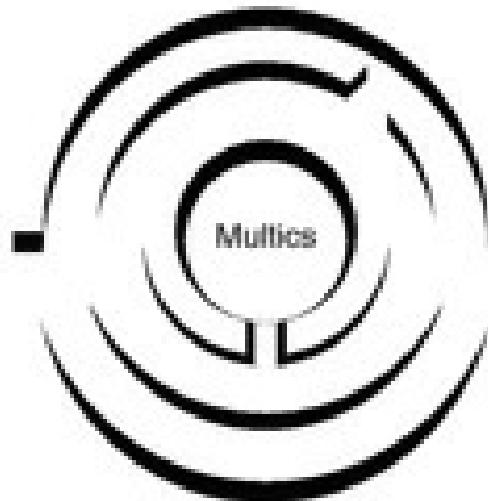
Volume in drive A has no label
Directory of A:\

COMMAND.COM 17664 3-08-83 12:00p
FORMAT.COM 6016 3-08-83 12:00p
CHKDSK.COM 6400 3-08-83 12:00p
SYS.COM 1488 3-08-83 12:00p
DEBUG.COM 11904 3-08-83 12:00p
SLOOK 32 1-01-88 7:44p
6 File(s) 292864 bytes free

A>_
```

MULTICS

Multics ("Multiplexed Information and Computing Service") is an influential early time-sharing operating system based on the concept of a single-level memory. Nathan Gregory writes that Multics "has influenced all modern operating systems since, from microcomputers to mainframes." Initial planning and development for Multics started in 1964, in Cambridge, Massachusetts. Originally it was a cooperative project led by MIT (Project MAC with Fernando Corbató) along with General Electric and Bell Labs. It was developed on the GE 645 computer, which was specially designed for it; the first one was delivered to MIT in January 1967. GE offered their earlier 635 systems with an early timesharing system known as "Mark I" and intended to offer the 645 with Multics as a larger successor. Bell withdrew from the project in 1969 as it became clear it would not deliver a working system in the short term. Shortly thereafter, GE decided to exit the computer industry entirely and sold the division to Honeywell in 1970. Honeywell offered Multics commercially, but with limited success.



MUSIC/SP

MUSIC/SP (Multi-User System for Interactive Computing/System Product; originally "McGill University System for Interactive Computing") was developed at McGill University in the 1970s from an early IBM time-sharing system called RAX (Remote Access Computing System). The system ran on IBM S/360, S/370, and 4300-series mainframe hardware, and offered then-novel features such as file access control and data compression. It was designed to allow academics and students to create and run their programs interactively on terminals, in an era when most mainframe computing was still being done from punched cards. Over the years, development continued and the system evolved to embrace email, the Internet and eventually the World Wide Web. At its peak in the late 1980s, there were over 250 universities, colleges and high school districts that used the system in North and South America, Europe and Asia.



MVS

Multiple Virtual Storage, more commonly called MVS, is the most commonly used operating system on the System/370, System/390 and IBM Z IBM mainframe computers. IBM developed MVS, along with OS/VS1 and SVS, as a successor to OS/360. It is unrelated to IBM's other mainframe operating system lines, e.g., VSE, VM, TPF.



MVS/ESA

Multiple Virtual Storage, more commonly called MVS, is the most commonly used operating system on the System/370, System/390 and IBM Z IBM mainframe computers. IBM developed MVS, along with OS/VS1 and SVS, as a successor to OS/360. It is unrelated to IBM's other mainframe operating system lines, e.g., VSE, VM, TPF.



Mac OS X Lion

OS X Lion, also known as Mac OS X Lion, (version 10.7) is the eighth major release of macOS, Apple's desktop and server operating system for Mac computers.



Mac OS X Server 1.0

Mac OS X Server 1.0 is an operating system developed by Apple Computer, Inc. Released on March 16, 1999, it was the first version of Mac OS X Server.



Mac OS X v10.0

Mac OS X 10.0 (code named Cheetah) is the first major release of Mac OS X, Apple's desktop and server operating system. It was released on March 24, 2001, for a price of \$129 after a public beta.



MacOS

macOS (; previously OS X and originally Mac OS X) is a Unix operating system developed and marketed by Apple Inc. since 2001. It is the primary operating system for Apple's Mac computers. Within the market of desktop and laptop computers it is the second most widely used desktop OS, after Microsoft Windows and ahead of ChromeOS.



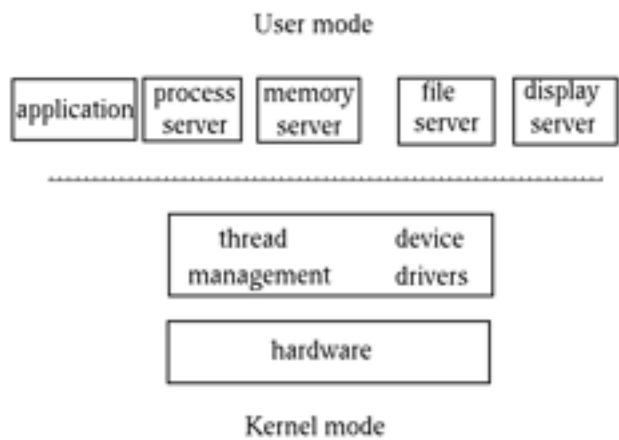
MacOS Server

Mac OS X Server (later called OS X Server and macOS Server), is a discontinued series of Unix-like server operating systems developed by Apple Inc. based on macOS. It provided server functionality and system administration tools, and provided tools to manage both macOS-based computers and iOS-based devices.



Mach (kernel)

Mach () is a kernel developed at Carnegie Mellon University by Richard Rashid and Avie Tevanian to support operating system research, primarily distributed and parallel computing. Mach is often considered one of the earliest examples of a microkernel. However, not all versions of Mach are microkernels. Mach's derivatives are the basis of the operating system kernel in GNU Hurd and of Apple's XNU kernel used in macOS, iOS, iPadOS, tvOS, and watchOS.



Machine code

In computer programming, machine code is any low-level programming language, consisting of machine language instructions, which are used to control a computer's central processing unit (CPU). Each instruction causes the CPU to perform a very specific task, such as a load, a store, a jump, or an arithmetic logic unit (ALU) operation on one or more units of data in the CPU's registers or memory.

Machine Code

```
10011101000110100000  
01100011010001110110  
10000010111101101110  
11110110001011011000  
10000010011100011011  
10010011000111000000
```

Machine learning

Machine learning (ML) is a field of inquiry devoted to understanding and building methods that "learn" ? that is, methods that leverage data to improve performance on some set of tasks. It is seen as a part of artificial intelligence.



Macintosh

The Mac (known as Macintosh until 1999) is a family of personal computers designed and marketed by Apple Inc. Macs are particularly known for their ease of use and minimalist designs, and are popular among students, creative professionals, and software engineers. The product lineup includes the MacBook Air and MacBook Pro laptops, as well as the iMac, Mac Mini, Mac Studio and Mac Pro desktops. Macs run the macOS operating system.



Magnetic tape

Magnetic tape is a medium for magnetic storage made of a thin, magnetizable coating on a long, narrow strip of plastic film. It was developed in Germany in 1928, based on the earlier magnetic wire recording from Denmark. Devices that use magnetic tape could with relative ease record and playback audio, visual, and binary computer data.



Mainframe computer

A mainframe computer, informally called a mainframe or big iron, is a computer used primarily by large organizations for critical applications like bulk data processing for tasks such as censuses, industry and consumer statistics, enterprise resource planning, and large-scale transaction processing. A mainframe computer is large but not as large as a supercomputer and has more processing power than some other classes of computers, such as minicomputers, servers, workstations, and personal computers. Most large-scale computer-system architectures were established in the 1960s, but they continue to evolve. Mainframe computers are often used as servers.



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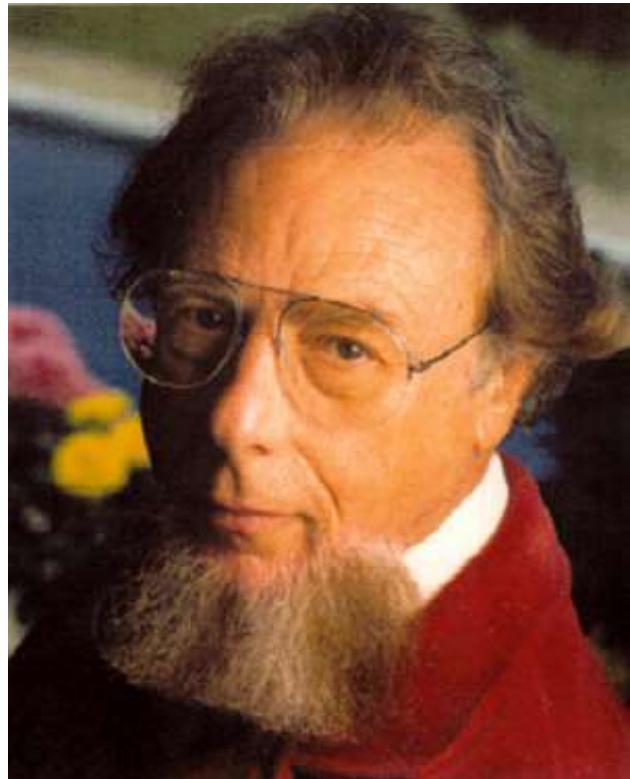
Manchester Mark 1

The Manchester Mark 1 was one of the earliest stored-program computers, developed at the Victoria University of Manchester, England from the Manchester Baby (operational in June 1948). Work began in August 1948, and the first version was operational by April 1949; a program written to search for Mersenne primes ran error-free for nine hours on the night of 16/17 June 1949.



Manfred Clynes

Manfred Edward Clynes (August 14, 1925 ? January 19, 2020) was an Austrian-born scientist, inventor, and musician. He is best known for his innovations and discoveries in the interpretation of music, and for his contributions to the study of biological systems and neurophysiology.



Manuela M. Veloso

Manuela Maria Veloso (born August 12, 1957) is the Head of J.P. Morgan AI Research & Herbert A. Simon University Professor in the School of Computer Science at Carnegie Mellon University, where she was previously Head of the Machine Learning Department.



Margaret Boden

Margaret Ann Boden (born 26 November 1936) is a Research Professor of Cognitive Science in the Department of Informatics at the University of Sussex, where her work embraces the fields of artificial intelligence, psychology, philosophy, and cognitive and computer science.



Margaret Mead

Margaret Mead (December 16, 1901 ? November 15, 1978) was an American cultural anthropologist who featured frequently as an author and speaker in the mass media during the 1960s and the 1970s. She earned her bachelor's degree at Barnard College of Columbia University and her M.A. and Ph.D. degrees from Columbia. Mead served as president of the American Association for the Advancement of Science in 1975. Mead was a communicator of anthropology in modern American and Western culture and was often controversial as an academic. Her reports detailing the attitudes towards sex in South Pacific and Southeast Asian traditional cultures influenced the 1960s sexual revolution. She was a proponent of broadening sexual conventions within the context of Western cultural traditions.



Mary Cartwright

Dame Mary Lucy Cartwright, (17 December 1900 ? 3 April 1998) was a British mathematician. She was one of the pioneers of what would later become known as chaos theory. Along with J. E. Littlewood, Cartwright saw many solutions to a problem which would later be seen as an example of the butterfly effect.



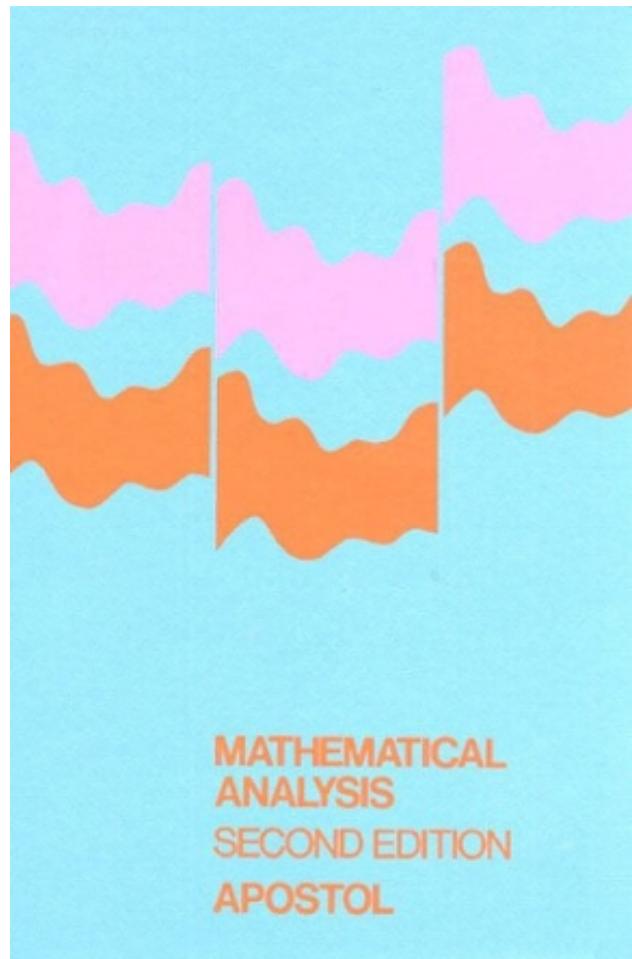
Mass storage

In computing, mass storage refers to the storage of large amounts of data in a persisting and machine-readable fashion. In general, the term is used as large in relation to contemporaneous hard disk drives, but it has been used large in relation to primary memory as for example with floppy disks on personal computers.



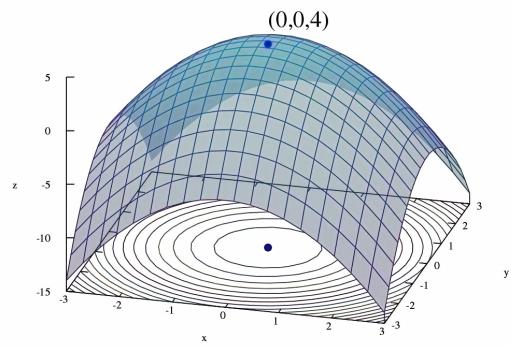
Mathematical analysis

Analysis is the branch of mathematics dealing with continuous functions, limits, and related theories, such as differentiation, integration, measure, infinite sequences, series, and analytic functions. These theories are usually studied in the context of real and complex numbers and functions. Analysis evolved from calculus, which involves the elementary concepts and techniques of analysis.



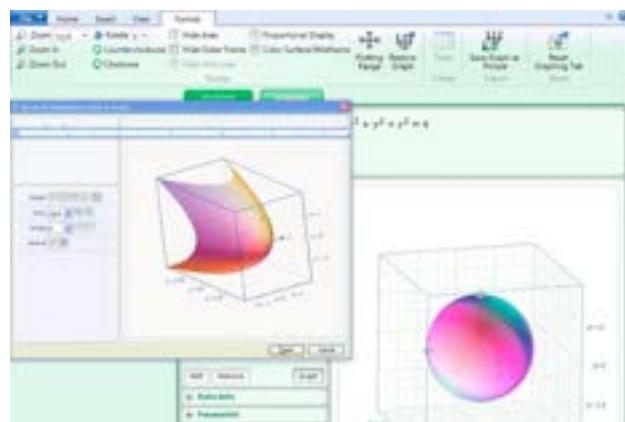
Mathematical optimization

Mathematical optimization (alternatively spelled optimisation) or mathematical programming is the selection of a best element, with regard to some criterion, from some set of available alternatives. It is generally divided into two subfields: discrete optimization and continuous optimization. Optimization problems of sorts arise in all quantitative disciplines from computer science and engineering to operations research and economics, and the development of solution methods has been of interest in mathematics for centuries. In the more general approach, an optimization problem consists of maximizing or minimizing a real function by systematically choosing input values from within an allowed set and computing the value of the function. The generalization of optimization theory and techniques to other formulations constitutes a large area of applied mathematics. More generally, optimization includes finding "best available" values of some objective function given a defined domain (or input), including a variety of different types of objective functions and different types of domains.



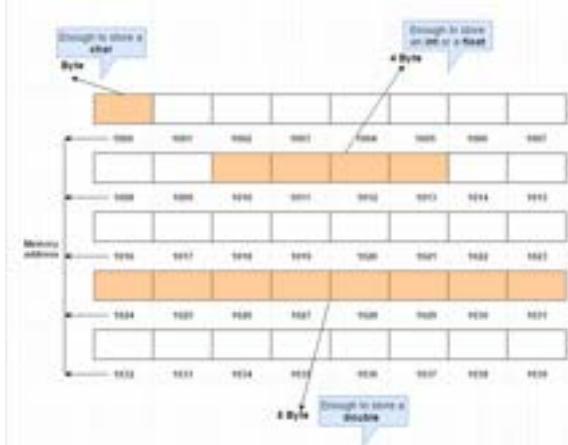
Mathematical software

Mathematical software is software used to model, analyze or calculate numeric, symbolic or geometric data.



Memory address

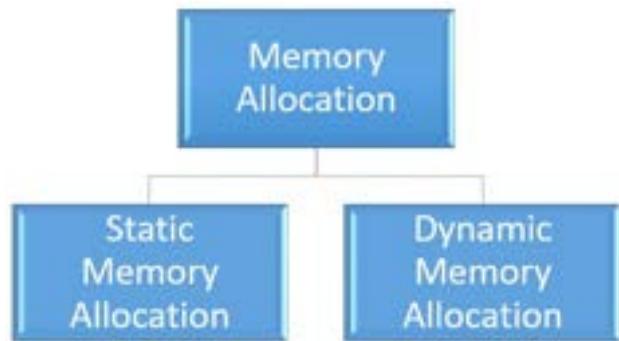
In computing, a memory address is a reference to a specific memory location used at various levels by software and hardware. Memory addresses are fixed-length sequences of digits conventionally displayed and manipulated as unsigned integers. Such numerical semantic bases itself upon features of CPU (such as the instruction pointer and incremental address registers), as well upon use of the memory like an array endorsed by various programming languages.



Memory allocation

Memory management is a form of resource management applied to computer memory. The essential requirement of memory management is to provide ways to dynamically allocate portions of memory to programs at their request, and free it for reuse when no longer needed. This is critical to any advanced computer system where more than a single process might be underway at any time. Several methods have been devised that increase the effectiveness of memory management.

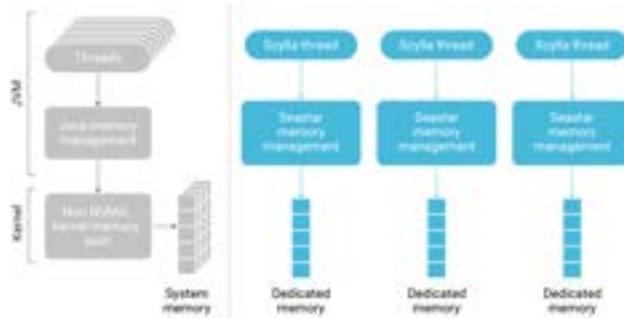
Virtual memory systems separate the memory addresses used by a process from actual physical addresses, allowing separation of processes and increasing the size of the virtual address space beyond the available amount of RAM using paging or swapping to secondary storage. The quality of the virtual memory manager can have an extensive effect on overall system performance.



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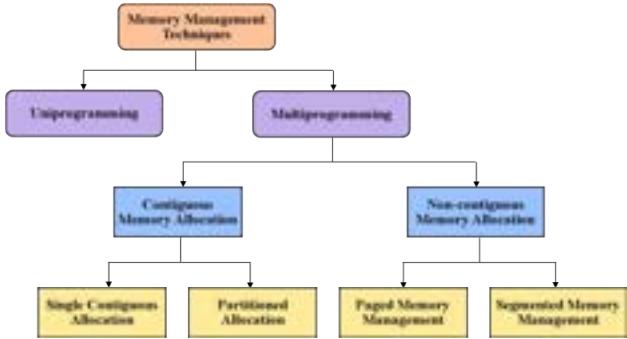
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Memory management (operating systems)

In operating systems, memory management is the function responsible for managing the computer's primary memory.:?105?208?

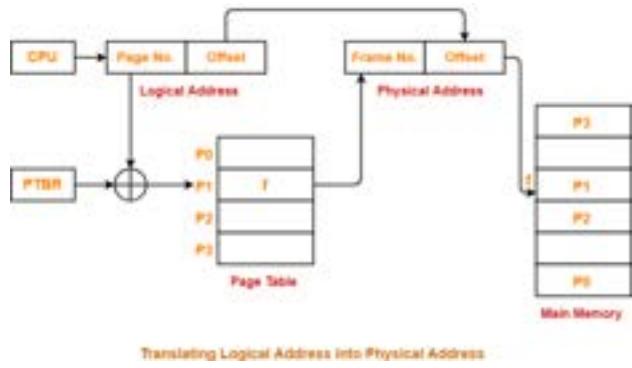
The memory management function keeps track of the status of each memory location, either allocated or free. It determines how memory is allocated among competing processes, deciding which gets memory, when they receive it, and how much they are allowed. When memory is allocated it determines which memory locations will be assigned. It tracks when memory is freed or unallocated and updates the status.



Memory paging

In computer operating systems, memory paging (or swapping on some Unix-like systems) is a memory management scheme by which a computer stores and retrieves data from secondary storage for use in main memory. In this scheme, the operating system retrieves data from secondary storage in same-size blocks called pages.

Paging is an important part of virtual memory implementations in modern operating systems, using secondary storage to let programs exceed the size of available physical memory.



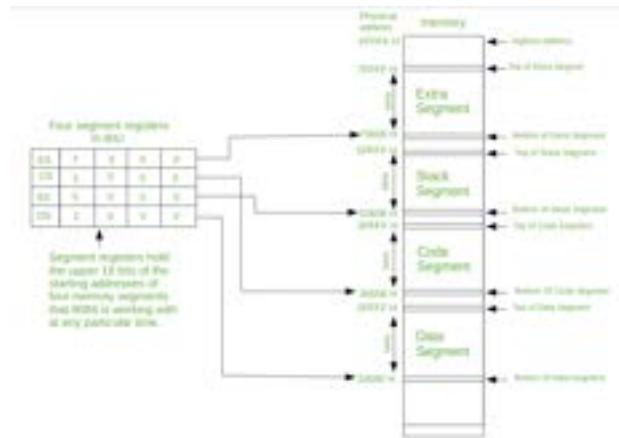
Memory protection

Memory protection is a way to control memory access rights on a computer, and is a part of most modern instruction set architectures and operating systems. The main purpose of memory protection is to prevent a process from accessing memory that has not been allocated to it. This prevents a bug or malware within a process from affecting other processes, or the operating system itself. Protection may encompass all accesses to a specified area of memory, write accesses, or attempts to execute the contents of the area. An attempt to access unauthorized memory results in a hardware fault, e.g., a segmentation fault, storage violation exception, generally causing abnormal termination of the offending process. Memory protection for computer security includes additional techniques such as address space layout randomization and executable space protection.



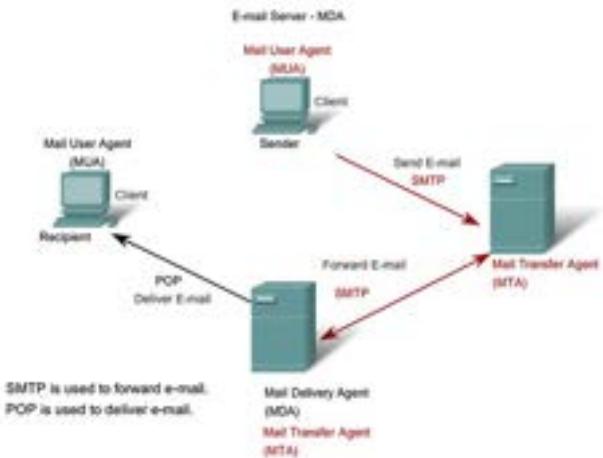
Memory segmentation

Memory segmentation is an operating system memory management technique of division of a computer's primary memory into segments or sections. In a computer system using segmentation, a reference to a memory location includes a value that identifies a segment and an offset (memory location) within that segment. Segments or sections are also used in object files of compiled programs when they are linked together into a program image and when the image is loaded into memory.



Message transfer agent

Within the Internet email system, a message transfer agent (MTA), or mail transfer agent, or mail relay is software that transfers electronic mail messages from one computer to another using SMTP. The terms mail server, mail exchanger, and MX host are also used in some contexts.



Metric system

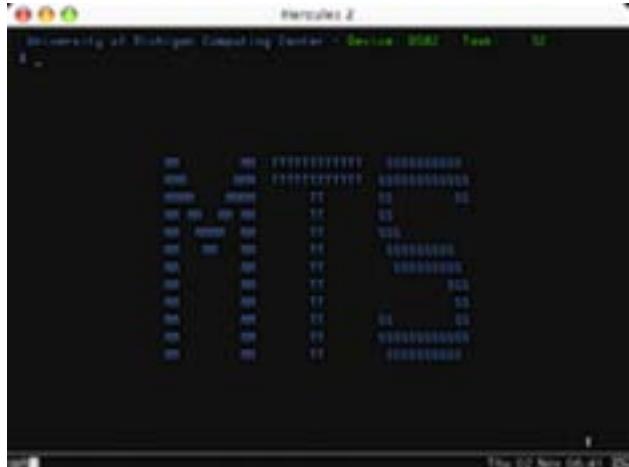
The metric system is a system of measurement that succeeded the decimalised system based on the metre that had been introduced in France in the 1790s. The historical development of these systems culminated in the definition of the International System of Units (SI) in the mid-20th century, under the oversight of an international standards body. Adopting the metric system is known as metrification.

Metric Units						
Kilogram	Hectometer	Dekameter	Unit	Decimeter	Centimeter	Millimeter
Kilometer	Hectometer	Dekameter	Meter	Decimeter	Centimeter	Millimeter
Kilogram	Hectogram	Dekagram	Gram	Decigram	Centigram	Milligram
Kiloliter	Hectoliter	Dekaliter	Liter	Deciliter	Centiliter	Milliliter

The diagram consists of six yellow arrows pointing to the right, each labeled with a multiplier of 10. The first arrow is labeled 'x 10' above it and '+ 10' below it. The subsequent five arrows are each labeled with a red 'x 10' above them and a green '+ 10' below them, indicating a continuous multiplication by 10 for each step along the scale.

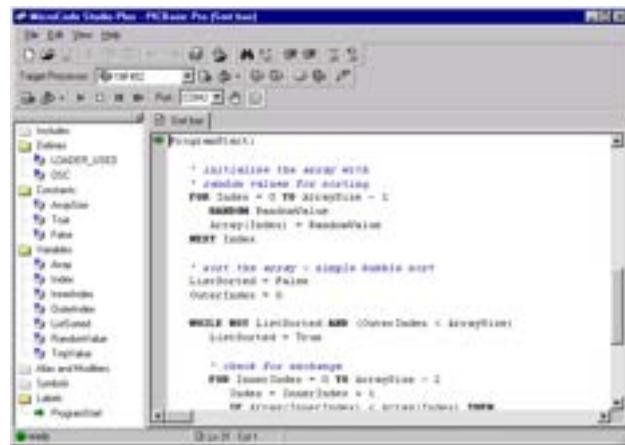
Michigan Terminal System

The Michigan Terminal System (MTS) is one of the first time-sharing computer operating systems. Developed in 1967 at the University of Michigan for use on IBM S/360-67, S/370 and compatible mainframe computers, it was developed and used by a consortium of eight universities in the United States, Canada, and the United Kingdom over a period of 33 years (1967 to 1999).



Microcode

In processor design, microcode is a technique that interposes an intermediate layer between the central processing unit (CPU) hardware and the programmer-visible instruction set architecture of a computer. Microcode is a layer of hardware-level instructions that implement higher-level machine code instructions or internal finite-state machine sequencing in many digital processing elements. Microcode is used in general-purpose central processing units, although in current desktop CPUs, it can be a fallback path for cases that the faster hardwired control unit cannot handle. Microcode typically resides in special high-speed memory and translates machine instructions, state machine data, or other input into sequences of detailed circuit-level operations. It separates the machine instructions from the underlying electronics so that instructions can be designed and altered more freely. It also facilitates the building of complex multi-step instructions, while reducing the complexity of computer circuits. Writing microcode is often called microprogramming and the microcode in a particular processor implementation is sometimes called a microprogram.



The screenshot shows a software interface for microcode development. The title bar reads "Microcode Editor Plus - PIC32MX4 Pro (Fast build)". The main window has two panes. The left pane, titled "Includes", lists various header files such as "INCLUDES.h", "LOADER_32C.h", "OSC.h", "Registers.h", "Analyze.h", "Tool.h", "File.h", "Memory.h", "Jump.h", "Table.h", "Instruction.h", "ControlWord.h", "ProgramCounter.h", "Registers.h", "Alin.h", and "Registers.h". The right pane, titled "Microcode", displays assembly-like pseudocode:

```
/* INITIALIZATION THE ARRAY WITH
 * random values for starting
 * FWR_Index = 0; WR_IndexValue = 1;
 * RAMIndex = RandomValue;
 * ArrayIndex = RandomValue;
 * RWR_Index = 0;
 *
 * write the array < simple function write
 * LineWritten = False
 * CounterIndex = 0;
 */
WHILE (WR_IndexWritten == 0) (CounterIndex < ArrayLength)
    LineWritten = True;
    /* check for exchange
     * WR_IndexValue = 0; WR_IndexValue = 1;
     * Index = CounterIndex + 1;
     * WR_IndexValue = ArrayValue[CounterIndex];
     * WR_IndexWritten = 1;
     */
    CounterIndex = CounterIndex + 1;
```

Microcomputer

A microcomputer is a small, relatively inexpensive computer having a central processing unit (CPU) made out of a microprocessor. The computer also includes memory and input/output (I/O) circuitry together mounted on a printed circuit board (PCB). Microcomputers became popular in the 1970s and 1980s with the advent of increasingly powerful microprocessors. The predecessors to these computers, mainframes and minicomputers, were comparatively much larger and more expensive (though indeed present-day mainframes such as the IBM System z machines use one or more custom microprocessors as their CPUs). Many microcomputers (when equipped with a keyboard and screen for input and output) are also personal computers (in the generic sense). An early use of the term personal computer in 1962 predates microprocessor-based designs. (See "Personal Computer: Computers at Companies" reference below). A microcomputer used as an embedded control system may have no human-readable input and output devices. "Personal computer" may be used generically or may denote an IBM PC compatible machine.



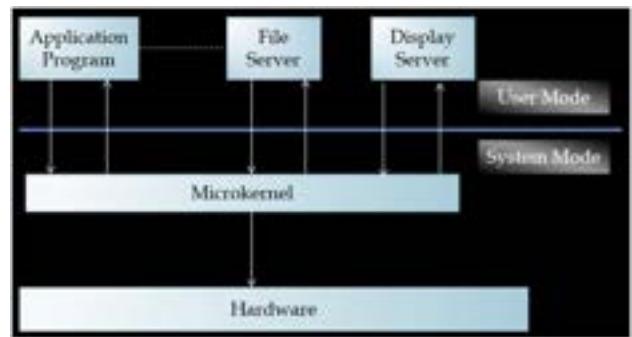
Microcontroller

A microcontroller (MCU for microcontroller unit, also MC, UC, or ?C) is a small computer on a single VLSI integrated circuit (IC) chip. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.



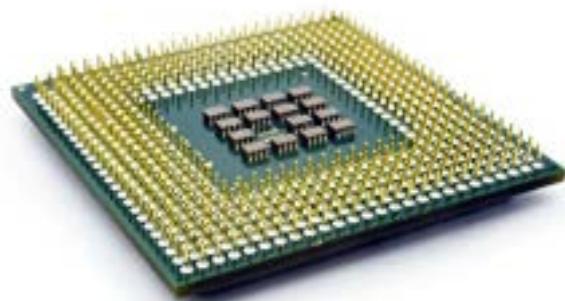
Microkernel

In computer science, a microkernel (often abbreviated as ?-kernel) is the near-minimum amount of software that can provide the mechanisms needed to implement an operating system (OS). These mechanisms include low-level address space management, thread management, and inter-process communication (IPC).



Microprocessor

A microprocessor is a computer processor where the data processing logic and control is included on a single integrated circuit (IC), or a small number of ICs. The microprocessor contains the arithmetic, logic, and control circuitry required to perform the functions of a computer's central processing unit (CPU). The IC is capable of interpreting and executing program instructions and performing arithmetic operations. The microprocessor is a multipurpose, clock-driven, register-based, digital integrated circuit that accepts binary data as input, processes it according to instructions stored in its memory, and provides results (also in binary form) as output. Microprocessors contain both combinational logic and sequential digital logic, and operate on numbers and symbols represented in the binary number system.



Microsoft

Microsoft Corporation is an American multinational technology corporation headquartered in Redmond, Washington, United States. Microsoft's best-known software products are the Windows line of operating systems, the Microsoft Office suite, and the Internet Explorer and Edge web browsers. Its flagship hardware products are the Xbox video game consoles and the Microsoft Surface lineup of touchscreen personal computers. Microsoft ranked No. 21 in the 2020 Fortune 500 rankings of the largest United States corporations by total revenue; it was the world's largest software maker by revenue as of 2019. It is one of the Big Five American information technology companies, alongside Alphabet (Google), Amazon, Apple, and Meta (Facebook).



Microsoft Windows

Windows is a group of several proprietary graphical operating system families developed and marketed by Microsoft. Each family caters to a certain sector of the computing industry. For example, Windows NT for consumers, Windows Server for servers, and Windows IoT for embedded systems. Defunct Windows families include Windows 9x, Windows Mobile, and Windows Phone.



Middleware

Middleware is a type of computer software that provides services to software applications beyond those available from the operating system. It can be described as "software glue". Middleware makes it easier for software developers to implement communication and input/output, so they can focus on the specific purpose of their application. It gained popularity in the 1980s as a solution to the problem of how to link newer applications to older legacy systems, although the term had been in use since 1968.



Midrange computer

Midrange computers, or midrange systems, were a class of computer systems that fell in between mainframe computers and microcomputers. This class of machine emerged in the 1960s, with models from Digital Equipment Corporation (PDP line), Data General (NOVA), Hewlett-Packard (HP3000) widely used in science and research as well as for business - and referred to as minicomputers. IBM favored the term "midrange computer" for their comparable, but more business-oriented systems.



Mihajlo D. Mesarovic

Mihajlo D. Mesarovic (Serbian Latin: Mihajlo D. Mesarović, Serbian Cyrillic: Михајло Д. Месаровић; born 2 July 1928) is a Serbian scientist, who is a professor of Systems Engineering and Mathematics at Case Western Reserve University. Mesarovic has been a pioneer in the field of systems theory, he was UNESCO Scientific Advisor on Global change and also a member of the Club of Rome.



Mike Jackson (systems scientist)

Michael Christopher Jackson OBE (born 1951) is a British systems scientist, consultant and Emeritus Professor of Management Systems and former Dean of Hull University Business School, known for his work in the field of systems thinking and management.



Minicomputer

A minicomputer, or colloquially mini, is a class of smaller general purpose computers that developed in the mid-1960s and sold at a much lower price than mainframe and mid-size computers from IBM and its direct competitors. In a 1970 survey, The New York Times suggested a consensus definition of a minicomputer as a machine costing less than US\$25,000 (equivalent to \$174,000 in 2021), with an input-output device such as a teleprinter and at least four thousand words of memory, that is capable of running programs in a higher level language, such as Fortran or BASIC. The class formed a distinct group with its own software architectures and operating systems. Minis were designed for control, instrumentation, human interaction, and communication switching as distinct from calculation and record keeping. Many were sold indirectly to original equipment manufacturers (OEMs) for final end-use application. During the two-decade lifetime of the minicomputer class (1965?1985), almost 100 companies formed and only a half dozen remained. When single-chip CPU microprocessors appeared, beginning with the Intel 4004 in 1971, the term "minicomputer" came to mean a machine that lies in the middle range of the computing spectrum, in between the smallest mainframe computers and the microcomputers. The term "minicomputer" is seldom used today; the contemporary term for this class of system is "midrange computer", such as the higher-end SPARC from Oracle, Power ISA from IBM, and Itanium-based systems from Hewlett-Packard.



Minix 3

Minix 3 is a small, Unix-like operating system. It is published under a BSD-3-Clause license and is a successor project to the earlier versions, Minix 1 and 2. The project's main goal is for the system to be fault-tolerant by detecting and repairing its faults on the fly, with no user intervention. The main uses of the system are envisaged to be embedded systems and education. As of 2017, Minix 3 supports IA-32 and ARM architecture processors. It can also run on emulators or virtual machines, such as Bochs, VMware Workstation, Microsoft Virtual PC, Oracle VirtualBox, and QEMU. A port to PowerPC architecture is in development. The distribution comes on a live CD and does not support live USB installation. Minix 3 is believed to have inspired the Intel Management Engine (ME) OS found in Intel's Platform Controller Hub, starting with the introduction of ME 11, which is used with Skylake and Kaby Lake processors. It was debated that Minix could have been the most widely used OS on x86/AMD64 processors, with more installations than Microsoft Windows, Linux, or macOS, because of its use in the Intel ME. The project has been dormant since 2018, and the latest release is 3.4.0 rc6 from 2017, although the Minix 3 discussion group is still active.



Mixed reality

Mixed reality (MR) is a term used to describe the merging of a real-world environment and a computer-generated one. Physical and virtual objects may co-exist in mixed reality environments and interact in real time.



Mnemonic

A mnemonic device (nih-MON-ik), or memory device, is any learning technique that aids information retention or retrieval (remembering) in the human memory for better understanding.

Mnemonic	
Please	P - Parenthesis
Excuse	E - Exponent
My	M - Multiplication
Dear	D - Division
Aunt	A - Addition
Sally	S - Subtraction

Mobile device

A mobile device (or handheld computer) is a computer small enough to hold and operate in the hand. Mobile devices typically have a flat LCD or OLED screen, a touchscreen interface, and digital or physical buttons. They may also have a physical keyboard. Many such devices can connect to the Internet and connect with other devices such as car entertainment systems or headsets via Wi-Fi, Bluetooth, cellular networks or near field communication. Integrated cameras, the ability to place and receive voice and video telephone calls, video games, and Global Positioning System (GPS) capabilities are common. Power is typically provided by a lithium-ion battery. Mobile devices may run mobile operating systems that allow third-party applications to be installed and run.



Mobile operating system

A mobile operating system is an operating system for smartphones, tablets, smartwatches, smartglasses, or other non-laptop personal mobile computing devices. While computers such as typical laptops are "mobile", the operating systems used on them are generally not considered mobile ones, as they were originally designed for desktop computers that historically did not have or need specific mobile features. This line distinguishing mobile and other forms has become blurred in recent years, due to the fact that newer devices have become smaller and more mobile unlike hardware of the past. Key notabilities blurring this line are the introduction of tablet computers and light-weight laptops and the hybridization of the two in 2-in-1 PCs.



Model of computation

In computer science, and more specifically in computability theory and computational complexity theory, a model of computation is a model which describes how an output of a mathematical function is computed given an input. A model describes how units of computations, memories, and communications are organized. The computational complexity of an algorithm can be measured given a model of computation. Using a model allows studying the performance of algorithms independently of the variations that are specific to particular implementations and specific technology.

en.wikipedia.org

**Model of
computation -
Wikipedia**

Modeling language

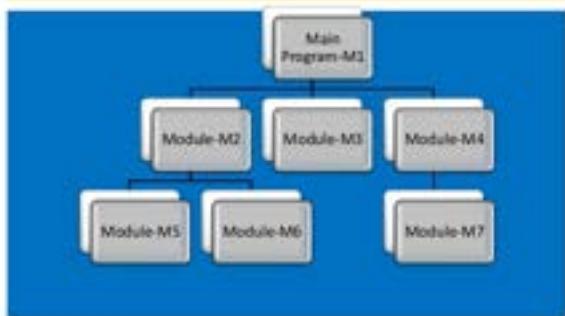
A modeling language is any artificial language that can be used to express information or knowledge or systems in a structure that is defined by a consistent set of rules. The rules are used for interpretation of the meaning of components in the structure Programming language.



Modular programming

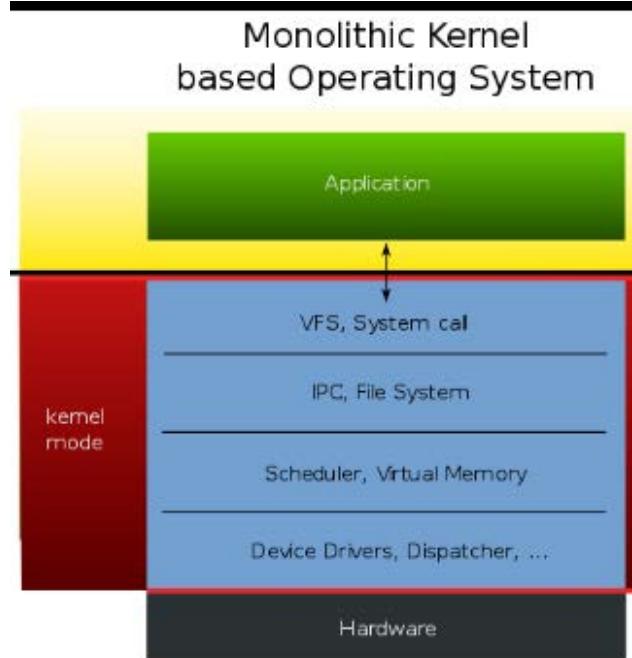
Modular programming is a software design technique that emphasizes separating the functionality of a program into independent, interchangeable modules, such that each contains everything necessary to execute only one aspect of the desired functionality.

Structure of Modular Programming



Monolithic kernel

A monolithic kernel is an operating system architecture where the entire operating system is working in kernel space. The monolithic model differs from other operating system architectures (such as the microkernel architecture) in that it alone defines a high-level virtual interface over computer hardware. A set of primitives or system calls implement all operating system services such as process management, concurrency, and memory management. Device drivers can be added to the kernel as modules.



MontaVista

MontaVista Software is a company that develops embedded Linux system software, development tools, and related software. Its products are made for other corporations developing embedded systems such as automotive electronics, communications equipment, mobile phones, and other electronic devices and infrastructure.



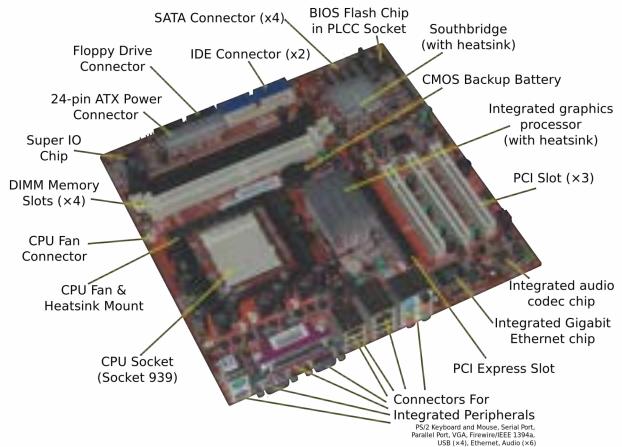
MorphOS

MorphOS is an AmigaOS-like computer operating system (OS). It is a mixed proprietary and open source OS produced for the Pegasos PowerPC (PPC) processor based computer, PowerUP accelerator equipped Amiga computers, and a series of Freescale development boards that use the Genesi firmware, including the Efika and mobileGT. Since MorphOS 2.4, Apple's Mac mini G4 is supported as well, and with the release of MorphOS 2.5 and MorphOS 2.6 the eMac and Power Mac G4 models are respectively supported. The release of MorphOS 3.2 added limited support for Power Mac G5. The core, based on the Quark microkernel, is proprietary, although several libraries and other parts are open source, such as the Ambient desktop.



Motherboard

A motherboard (also called mainboard, main circuit board, mb, mboard, backplane board, base board, system board, logic board (only in Apple computers) or mobo) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.



Mouse (computing)

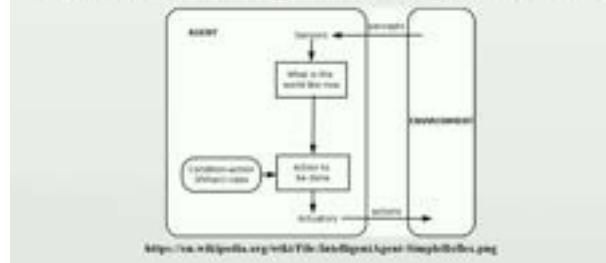
A computer mouse (plural mice, also mouses) is a hand-held pointing device that detects two-dimensional motion relative to a surface. This motion is typically translated into the motion of a pointer on a display, which allows a smooth control of the graphical user interface of a computer.



Multi-agent system

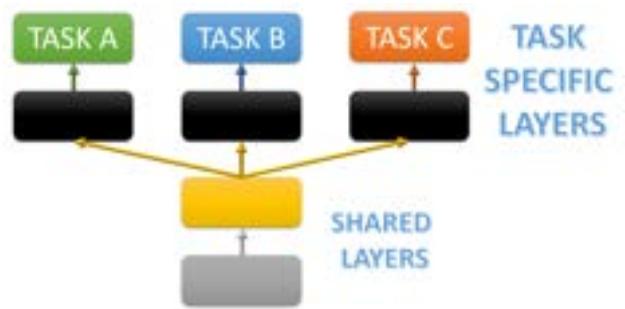
A multi-agent system (MAS or "self-organized system") is a computerized system composed of multiple interacting intelligent agents. Multi-agent systems can solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include methodic, functional, procedural approaches, algorithmic search or reinforcement learning. Despite considerable overlap, a multi-agent system is not always the same as an agent-based model (ABM). The goal of an ABM is to search for explanatory insight into the collective behavior of agents (which don't necessarily need to be "intelligent") obeying simple rules, typically in natural systems, rather than in solving specific practical or engineering problems. The terminology of ABM tends to be used more often in the science, and MAS in engineering and technology. Applications where multi-agent systems research may deliver an appropriate approach include online trading, disaster response, target surveillance and social structure modelling.

Multi-agent system



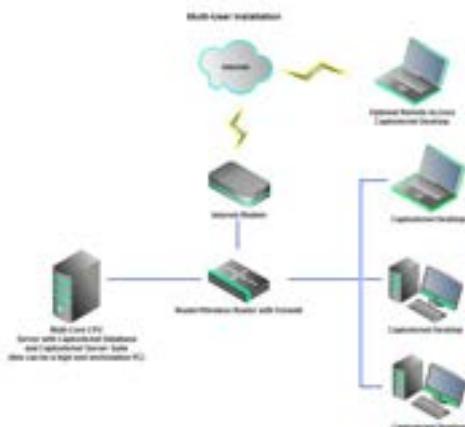
Multi-task learning

Multi-task learning (MTL) is a subfield of machine learning in which multiple learning tasks are solved at the same time, while exploiting commonalities and differences across tasks. This can result in improved learning efficiency and prediction accuracy for the task-specific models, when compared to training the models separately. Early versions of MTL were called "hints".



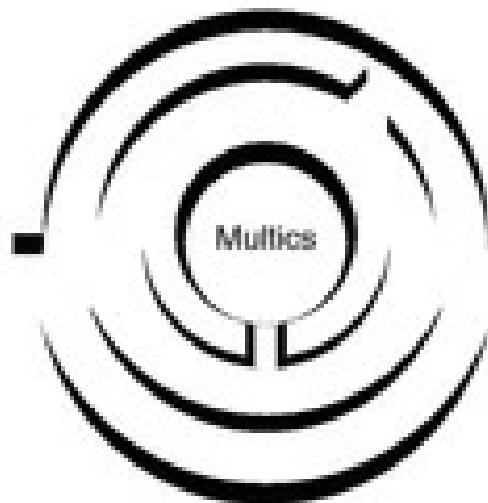
Multi-user

Multi-user software is computer software that allows access by multiple users of a computer. Time-sharing systems are multi-user systems. Most batch processing systems for mainframe computers may also be considered "multi-user", to avoid leaving the CPU idle while it waits for I/O operations to complete. However, the term "multitasking" is more common in this context.



Multics

Multics ("Multiplexed Information and Computing Service") is an influential early time-sharing operating system based on the concept of a single-level memory. Nathan Gregory writes that Multics "has influenced all modern operating systems since, from microcomputers to mainframes." Initial planning and development for Multics started in 1964, in Cambridge, Massachusetts. Originally it was a cooperative project led by MIT (Project MAC with Fernando Corbató) along with General Electric and Bell Labs. It was developed on the GE 645 computer, which was specially designed for it; the first one was delivered to MIT in January 1967. GE offered their earlier 635 systems with an early timesharing system known as "Mark I" and intended to offer the 645 with Multics as a larger successor. Bell withdrew from the project in 1969 as it became clear it would not deliver a working system in the short term. Shortly thereafter, GE decided to exit the computer industry entirely and sold the division to Honeywell in 1970. Honeywell offered Multics commercially, but with limited success.



Multikernel

A multikernel operating system treats a multi-core machine as a network of independent cores, as if it were a distributed system. It does not assume shared memory but rather implements inter-process communications as message-passing. Barreelfish was the first operating system to be described as a multikernel.



Multilevel feedback queue

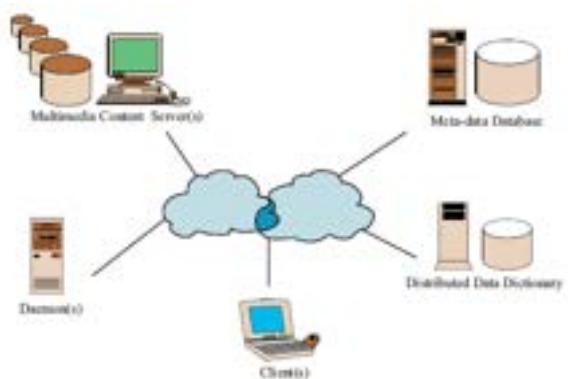
In computer science, a multilevel feedback queue is a scheduling algorithm. Scheduling algorithms are designed to have some process running at all times to keep the central processing unit (CPU) busy. The multilevel feedback queue extends standard algorithms with the following design requirements:

Multilevel Feedback Queue

- A process can move between the various queues. A way to implement aging.
- Multilevel feedback queue scheduler is defined as follows:
 - number of queues,
 - scheduling policy for each queue,
 - method used to upgrade a process,
 - method used to degrade a process,
 - method used to introduce a process (which queue)
 - inter-scheduling between the queues (usually strict priority).

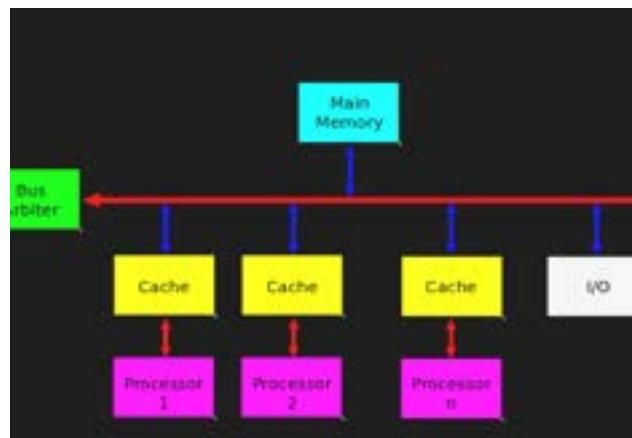
Multimedia database

A Multimedia database (MMDB) is a collection of related multimedia data. The multimedia data include one or more primary media data types such as text, images, graphic objects (including drawings, sketches and illustrations) animation sequences, audio and video.



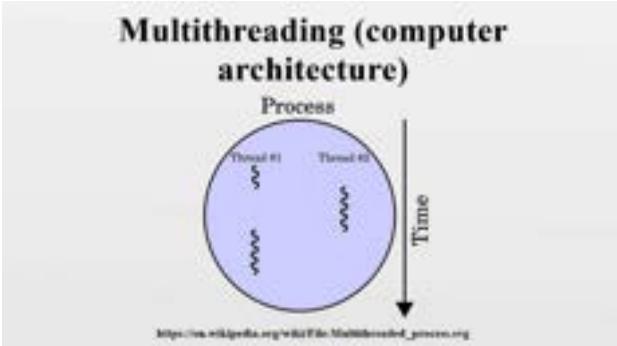
Multiprocessing

Multiprocessing is the use of two or more central processing units (CPUs) within a single computer system. The term also refers to the ability of a system to support more than one processor or the ability to allocate tasks between them. There are many variations on this basic theme, and the definition of multiprocessing can vary with context, mostly as a function of how CPUs are defined (multiple cores on one die, multiple dies in one package, multiple packages in one system unit, etc.).



Multithreading (computer architecture)

In computer architecture, multithreading is the ability of a central processing unit (CPU) (or a single core in a multi-core processor) to provide multiple threads of execution concurrently, supported by the operating system. This approach differs from multiprocessing. In a multithreaded application, the threads share the resources of a single or multiple cores, which include the computing units, the CPU caches, and the translation lookaside buffer (TLB).



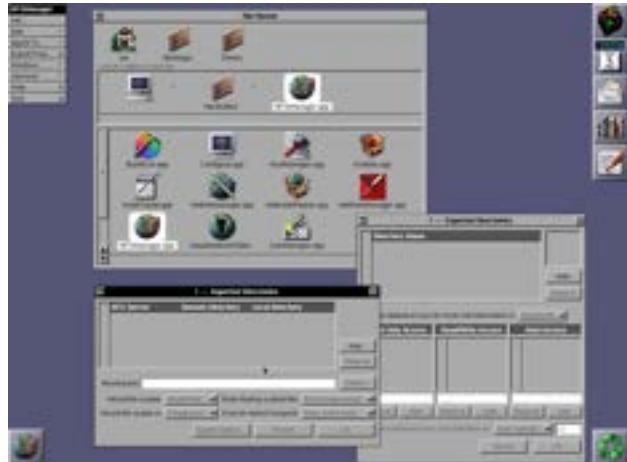
Murray Bowen

Murray Bowen (; January 31, 1913, in Waverly, Tennessee ? October 9, 1990) was an American psychiatrist and a professor in psychiatry at Georgetown University. Bowen was among the pioneers of family therapy and a noted founder of systemic therapy. Beginning in the 1950s he developed a systems theory of the family.



NEXTSTEP

NeXTSTEP is a discontinued object-oriented, multitasking operating system based on the Mach kernel and the UNIX-derived BSD. It was developed by NeXT Computer in the late 1980s and early 1990s and was initially used for its range of proprietary workstation computers such as the NeXTcube. It was later ported to several other computer architectures.



NOS (software)

NOS (Network Operating System) is a discontinued operating system with time-sharing capabilities, written by Control Data Corporation in the 1970s. NOS ran on the 60-bit CDC 6000 series of mainframe computers and their successors. NOS replaced the earlier CDC Kronos operating system of the 1970s. NOS was intended to be the sole operating system for all CDC machines, a fact CDC promoted heavily. NOS was replaced with NOS/VE on the 64-bit Cyber-180 systems in the mid-1980s.



NTFS

New Technology File System (NTFS) is a proprietary journaling file system developed by Microsoft. Starting with Windows NT 3.1, it is the default file system of the Windows NT family. It superseded File Allocation Table (FAT) as the preferred filesystem on Windows and is supported in Linux and BSD as well. NTFS reading and writing support is provided using a free and open-source kernel implementation known as NTFS3 in Linux and the NTFS-3G driver in BSD. By using the convert command, Windows can convert FAT32/16/12 into NTFS without the need to rewrite all files. NTFS uses several files typically hidden from the user to store metadata about other files stored on the drive which can help improve speed and performance when reading data. Unlike FAT and High Performance File System (HPFS), NTFS supports access control lists (ACLs), filesystem encryption, transparent compression, sparse files and file system journaling. NTFS also supports shadow copy to allow backups of a system while it is running, but the functionality of the shadow copies varies between different versions of Windows.



NTFS-3G

NTFS-3G is an open-source cross-platform implementation of the Microsoft Windows NTFS file system with read/write support. NTFS-3G often uses the FUSE file system interface, so it can run unmodified on many different operating systems. It is runnable on Linux, FreeBSD, NetBSD, OpenSolaris, illumos, BeOS, QNX, WinCE, Nucleus, VxWorks, Haiku, MorphOS, Minix, macOS and OpenBSD. It is licensed under the GNU General Public License. It is a partial fork of ntfsprogs and is under active maintenance and development.



Natural language processing

Natural language processing (NLP) is an interdisciplinary subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language, in particular how to program computers to process and analyze large amounts of natural language data. The goal is a computer capable of "understanding" the contents of documents, including the contextual nuances of the language within them. The technology can then accurately extract information and insights contained in the documents as well as categorize and organize the documents themselves.



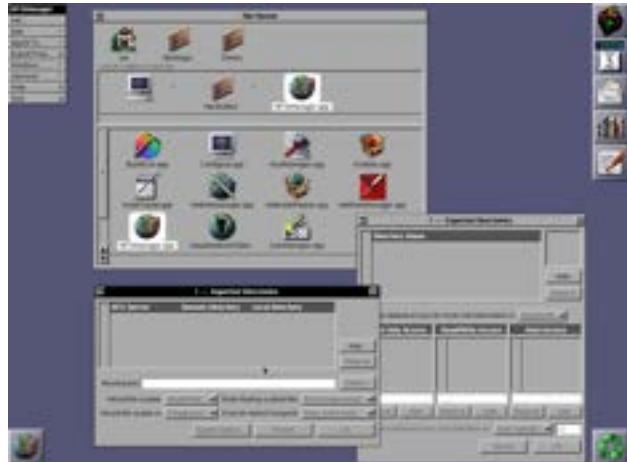
NeXT

NeXT, Inc. (later NeXT Computer, Inc. and NeXT Software, Inc.) was an American technology company that specialized in computer workstations intended for higher education and business use. Based in Redwood City, California, and founded by Apple Computer co-founder and CEO Steve Jobs after he was forced out of Apple, the company introduced their first product, the NeXT Computer, in 1988, and then the smaller NeXTcube and NeXTstation in 1990. These computers had relatively limited sales, with only about 50,000 units shipped in total. Nevertheless, their object-oriented programming and graphical user interfaces were trendsetters of computer innovation, and highly influential.



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Negative feedback

Negative feedback (or balancing feedback) occurs when some function of the output of a system, process, or mechanism is fed back in a manner that tends to reduce the fluctuations in the output, whether caused by changes in the input or by other disturbances.



Nervous system

In biology, the nervous system is the highly complex part of an animal that coordinates its actions and sensory information by transmitting signals to and from different parts of its body. The nervous system detects environmental changes that impact the body, then works in tandem with the endocrine system to respond to such events. Nervous tissue first arose in wormlike organisms about 550 to 600 million years ago. In vertebrates it consists of two main parts, the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS consists of the brain and spinal cord. The PNS consists mainly of nerves, which are enclosed bundles of the long fibers or axons, that connect the CNS to every other part of the body. Nerves that transmit signals from the brain are called motor nerves or efferent nerves, while those nerves that transmit information from the body to the CNS are called sensory nerves or afferent. Spinal nerves are mixed nerves that serve both functions. The PNS is divided into three separate subsystems, the somatic, autonomic, and enteric nervous systems. Somatic nerves mediate voluntary movement. The autonomic nervous system is further subdivided into the sympathetic and the parasympathetic nervous systems. The sympathetic nervous system is activated in cases of emergencies to mobilize energy, while the parasympathetic nervous system is activated when organisms are in a relaxed state. The enteric nervous system functions to control the gastrointestinal system. Both autonomic and enteric nervous systems function involuntarily. Nerves that exit from the cranium are called cranial nerves while those exiting from the spinal cord are called spinal nerves.

NetBSD

NetBSD is a free and open-source Unix operating system based on the Berkeley Software Distribution (BSD). It was the first open-source BSD descendant officially released after 386BSD was forked. It continues to be actively developed and is available for many platforms, including servers, desktops, handheld devices, and embedded systems. The NetBSD project focuses on code clarity, careful design, and portability across many computer architectures. Its source code is publicly available and permissively licensed.



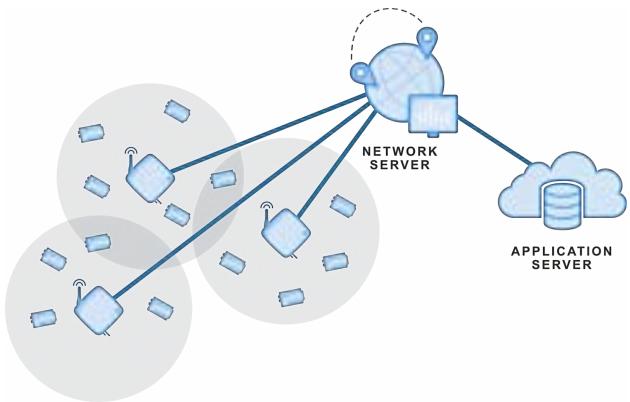
Network File System

Network File System (NFS) is a distributed file system protocol originally developed by Sun Microsystems (Sun) in 1984, allowing a user on a client computer to access files over a computer network much like local storage is accessed. NFS, like many other protocols, builds on the Open Network Computing Remote Procedure Call (ONC RPC) system. NFS is an open IETF standard defined in a Request for Comments (RFC), allowing anyone to implement the protocol.



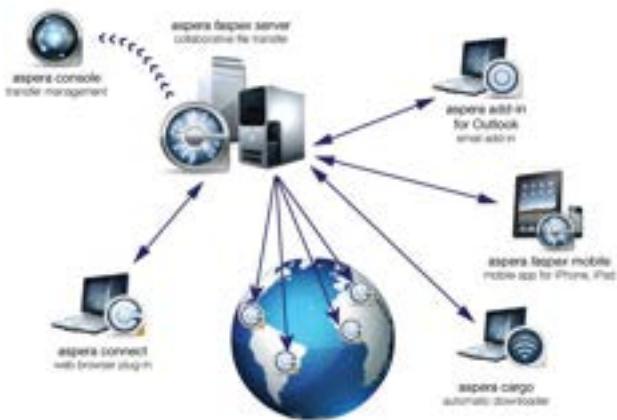
Network architecture

Network architecture is the design of a computer network. It is a framework for the specification of a network's physical components and their functional organization and configuration, its operational principles and procedures, as well as communication protocols used.



Network operating system

A network operating system (NOS) is a specialized operating system for a network device such as a router, switch or firewall.



Network performance

Network performance refers to measures of service quality of a network as seen by the customer.

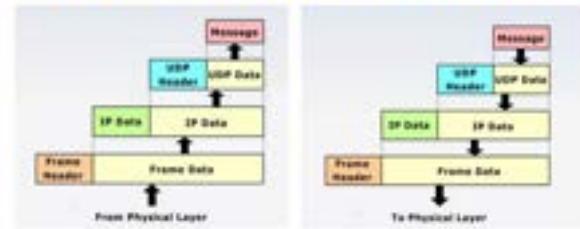


Network protocol

A communication protocol is a system of rules that allows two or more entities of a communications system to transmit information via any kind of variation of a physical quantity. The protocol defines the rules, syntax, semantics and synchronization of communication and possible error recovery methods. Protocols may be implemented by hardware, software, or a combination of both. Communicating systems use well-defined formats for exchanging various messages. Each message has an exact meaning intended to elicit a response from a range of possible responses pre-determined for that particular situation. The specified behavior is typically independent of how it is to be implemented. Communication protocols have to be agreed upon by the parties involved. To reach an agreement, a protocol may be developed into a technical standard. A programming language describes the same for computations, so there is a close analogy between protocols and programming languages: protocols are to communication what programming languages are to computations. An alternate formulation states that protocols are to communication what algorithms are to computation. Multiple protocols often describe different aspects of a single communication. A group of protocols designed to work together is known as a protocol suite; when implemented in software they are a protocol stack.

Network Protocols

Encapsulation, Decapsulation and Queuing



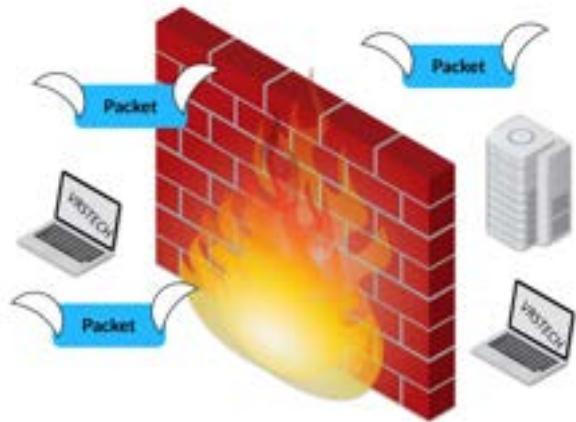
Network scheduler

A network scheduler, also called packet scheduler, queueing discipline (qdisc) or queueing algorithm, is an arbiter on a node in a packet switching communication network. It manages the sequence of network packets in the transmit and receive queues of the protocol stack and network interface controller. There are several network schedulers available for the different operating systems, that implement many of the existing network scheduling algorithms.



Network security

Network security consists of the policies, processes and practices adopted to prevent, detect and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network, which is controlled by the network administrator. Users choose or are assigned an ID and password or other authenticating information that allows them access to information and programs within their authority. Network security covers a variety of computer networks, both public and private, that are used in everyday jobs: conducting transactions and communications among businesses, government agencies and individuals. Networks can be private, such as within a company, and others which might be open to public access. Network security is involved in organizations, enterprises, and other types of institutions. It does as its title explains: it secures the network, as well as protecting and overseeing operations being done. The most common and simple way of protecting a network resource is by assigning it a unique name and a corresponding password.



Network service

In computer networking, a network service is an application running at the network application layer and above, that provides data storage, manipulation, presentation, communication or other capability which is often implemented using a client?server or peer-to-peer architecture based on application layer network protocols. Each service is usually provided by a server component running on one or more computers (often a dedicated server computer offering multiple services) and accessed via a network by client components running on other devices. However, the client and server components can both be run on the same machine.



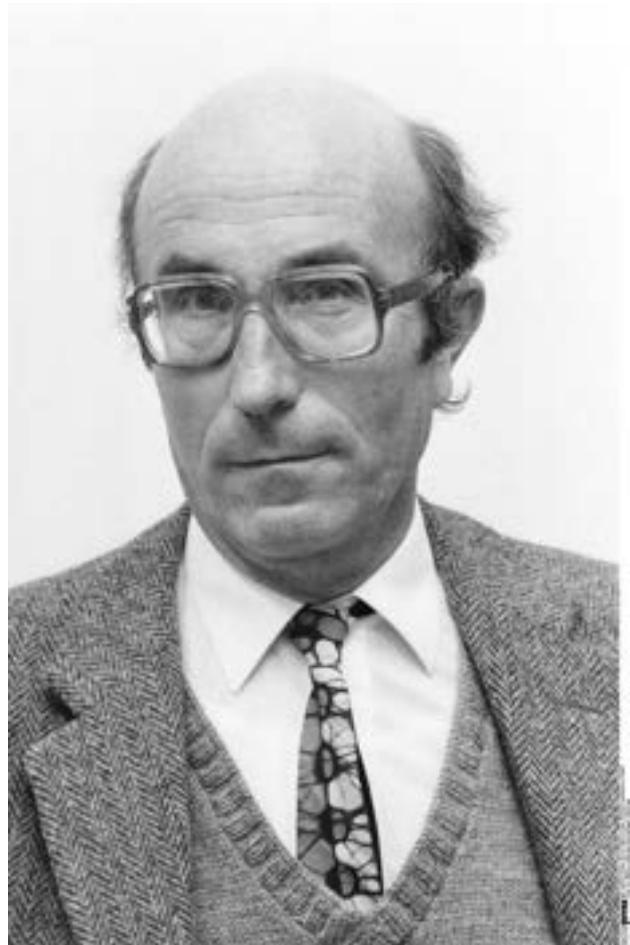
Networking hardware

Networking hardware, also known as network equipment or computer networking devices, are electronic devices which are required for communication and interaction between devices on a computer network. Specifically, they mediate data transmission in a computer network. Units which are the last receiver or generate data are called hosts, end systems or data terminal equipment.



Niklas Luhmann

Niklas Luhmann (; German: [?lu?man]; December 8, 1927 – November 6, 1998) was a German sociologist, philosopher of social science, and a prominent thinker in systems theory.



Niklaus Wirth

Niklaus Emil Wirth (born 15 February 1934) is a Swiss computer scientist. He has designed several programming languages, including Pascal, and pioneered several classic topics in software engineering. In 1984, he won the Turing Award, generally recognized as the highest distinction in computer science, for developing a sequence of innovative computer languages.



Non-volatile memory

Non-volatile memory (NVM) or non-volatile storage is a type of computer memory that can retain stored information even after power is removed. In contrast, volatile memory needs constant power in order to retain data.



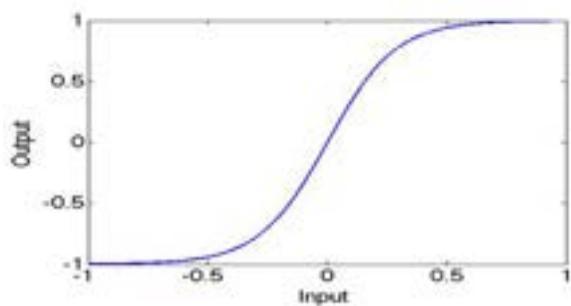
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Nonlinear system

In mathematics and science, a nonlinear system is a system in which the change of the output is not proportional to the change of the input. Nonlinear problems are of interest to engineers, biologists, physicists, mathematicians, and many other scientists since most systems are inherently nonlinear in nature. Nonlinear dynamical systems, describing changes in variables over time, may appear chaotic, unpredictable, or counterintuitive, contrasting with much simpler linear systems.



Norbert Wiener

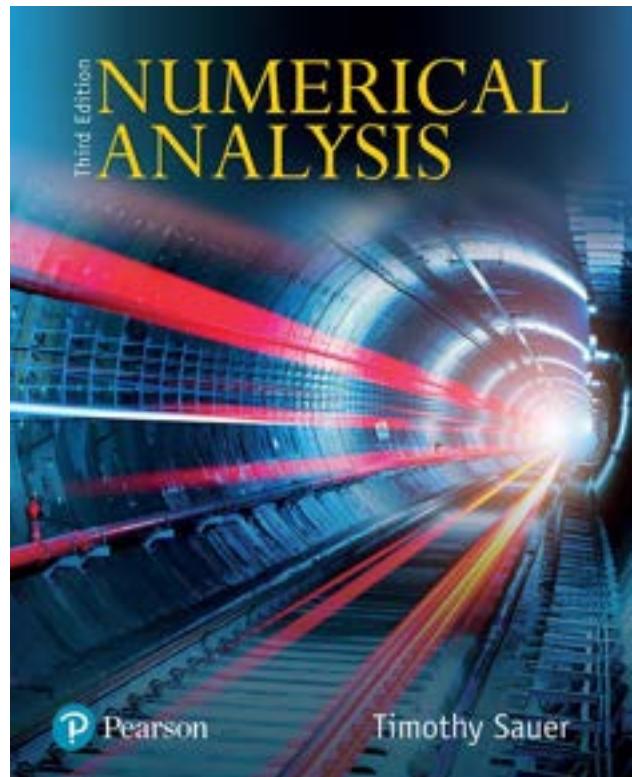
Norbert Wiener (November 26, 1894 ? March 18, 1964) was an American mathematician and philosopher. He was a professor of mathematics at the Massachusetts Institute of Technology (MIT). A child prodigy, Wiener later became an early researcher in stochastic and mathematical noise processes, contributing work relevant to electronic engineering, electronic communication, and control systems.



Numerical analysis

Numerical analysis is the study of algorithms that use numerical approximation (as opposed to symbolic manipulations) for the problems of mathematical analysis (as distinguished from discrete mathematics). It is the study of numerical methods that attempt at finding approximate solutions of problems rather than the exact ones.

Numerical analysis finds application in all fields of engineering and the physical sciences, and in the 21st century also the life and social sciences, medicine, business and even the arts. Current growth in computing power has enabled the use of more complex numerical analysis, providing detailed and realistic mathematical models in science and engineering. Examples of numerical analysis include: ordinary differential equations as found in celestial mechanics (predicting the motions of planets, stars and galaxies), numerical linear algebra in data analysis, and stochastic differential equations and Markov chains for simulating living cells in medicine and biology.



OEM

An original equipment manufacturer (OEM) is generally perceived as a company that produces non-aftermarket parts and equipment that may be marketed by another manufacturer. It is a common industry term recognized and used by many professional organizations such as SAE International, ISO, and others.



ORVYL

ORVYL is a time-sharing monitor developed by Stanford University for IBM System/360 and System/370 computers in 1967?68. ORVYL was one of the first time-sharing systems to be made available for IBM computers. Wylbur is a text editor and word processor program designed to work either without ORVYL, or in conjunction with ORVYL.



OS 2200

OS 2200 is the operating system for the Unisys ClearPath Dorado family of mainframe systems. The operating system kernel of OS 2200 is a lineal descendant of Exec 8 for the UNIVAC 1108.



OS/2

OS/2 (Operating System/2) is a series of computer operating systems, initially created by Microsoft and IBM under the leadership of IBM software designer Ed Iacobucci. As a result of a feud between the two companies over how to position OS/2 relative to Microsoft's new Windows 3.1 operating environment, the two companies severed the relationship in 1992 and OS/2 development fell to IBM exclusively. The name stands for "Operating System/2", because it was introduced as part of the same generation change release as IBM's "Personal System/2 (PS/2)" line of second-generation personal computers. The first version of OS/2 was released in December 1987 and newer versions were released until December 2001.

OS/360

OS/360, officially known as IBM System/360 Operating System, is a discontinued batch processing operating system developed by IBM for their then-new System/360 mainframe computer, announced in 1964; it was influenced by the earlier IBSYS/IBJOB and Input/Output Control System (IOCS) packages for the IBM 7090/7094 and even more so by the PR155 Operating System for the IBM 1410/7010 processors. It was one of the earliest operating systems to require the computer hardware to include at least one direct access storage device.



OS/360 and successors

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Jesse Russell, Ronald Cohn

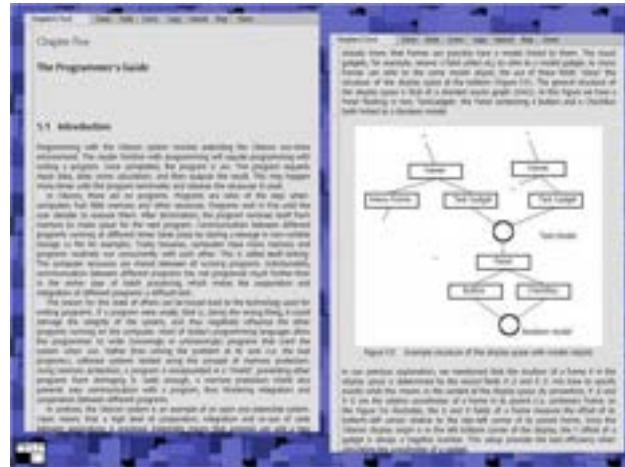
OS/360 and successors



Bookvika publishing

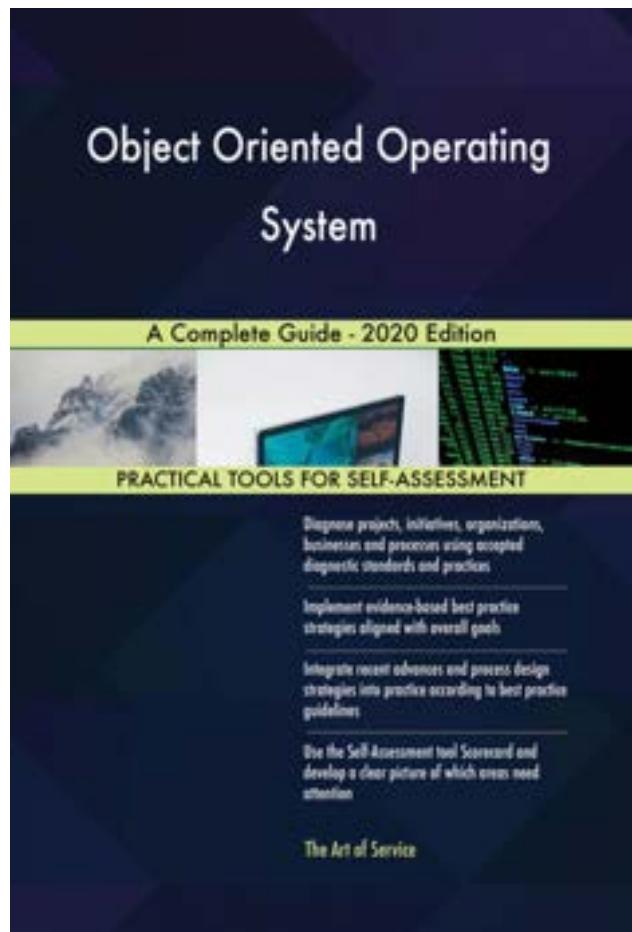
Oberon (operating system)

The Oberon System is a modular, single-user, single-process, multitasking operating system written in the programming language Oberon. It was originally developed in the late 1980s at ETH Zurich. The Oberon System has an unconventional visual text user interface (TUI) instead of a conventional command-line interface (CLI) or graphical user interface (GUI). This TUI was very innovative in its time and influenced the design of the Acme text editor for the Plan 9 from Bell Labs operating system.



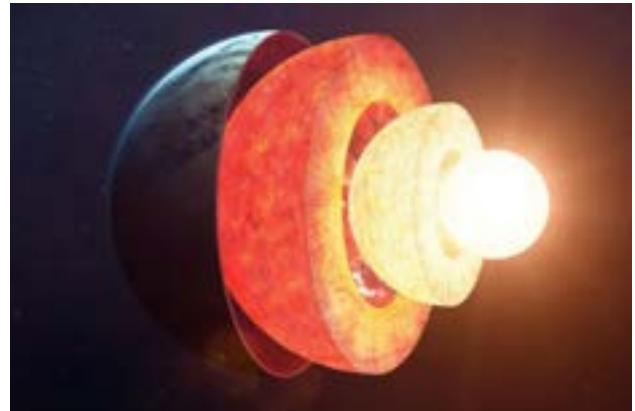
Object-oriented operating system

An object-oriented operating system is an operating system that is designed, structured, and operated using object-oriented programming principles.



Open core

The open-core model is a business model for the monetization of commercially produced open-source software. Coined by Andrew Lampitt in 2008, the open-core model primarily involves offering a "core" or feature-limited version of a software product as free and open-source software, while offering "commercial" versions or add-ons as proprietary software. The concept of open-core software has proven to be controversial, as many developers do not consider the business model to be true open-source software. Despite this, open-core models are used by many open-source software companies.



Open-source software

Open-source software (OSS) is computer software that is released under a license in which the copyright holder grants users the rights to use, study, change, and distribute the software and its source code to anyone and for any purpose. Open-source software may be developed in a collaborative public manner. Open-source software is a prominent example of open collaboration, meaning any capable user is able to participate online in development, making the number of possible contributors indefinite. The ability to examine the code facilitates public trust in the software. Open-source software development can bring in diverse perspectives beyond those of a single company. A 2008 report by the Standish Group stated that adoption of open-source software models has resulted in savings of about \$60 billion per year for consumers. Open source code can be used for studying and allows capable end users to adapt software to their personal needs in a similar way user scripts and custom style sheets allow for web sites, and eventually publish the modification as a fork for users with similar preferences, and directly submit possible improvements as pull requests.



OpenBSD

OpenBSD is a security-focused, free and open-source, Unix-like operating system based on the Berkeley Software Distribution (BSD). Theo de Raadt created OpenBSD in 1995 by forking NetBSD 1.0. According to the website, the OpenBSD project emphasizes "portability, standardization, correctness, proactive security and integrated cryptography." The OpenBSD project maintains portable versions of many subsystems as packages for other operating systems. Because of the project's preferred BSD license, many components are reused in proprietary and corporate-sponsored software projects. The firewall code in Apple's macOS is based on OpenBSD's PF firewall code, Android's Bionic C standard library is based on OpenBSD code, LLVM uses OpenBSD's regular expression library, and Windows 10 uses OpenSSH (OpenBSD Secure Shell) with LibreSSL. The word "open" in the name OpenBSD refers to the availability of the operating system source code on the Internet, although the word "open" in the name OpenSSH means "OpenBSD". It also refers to the wide range of hardware platforms the system supports.



OpenVMS

OpenVMS, often referred to as just VMS, is a multi-user, multiprocessing and virtual memory-based operating system. It is designed to support time-sharing, batch processing, transaction processing and workstation applications. Customers using OpenVMS include banks and financial services, hospitals and healthcare, telecommunications operators, network information services, and industrial manufacturers. During the 1990s and 2000s, there were approximately half a million VMS systems in operation worldwide. It was first announced by Digital Equipment Corporation (DEC) as VAX/VMS (Virtual Address eXtension/Virtual Memory System) alongside the VAX-11/780 minicomputer in 1977. OpenVMS has subsequently been ported to run on DEC Alpha systems, the Itanium-based HPE Integrity Servers, and select x86-64 hardware and hypervisors. Since 2014, OpenVMS is developed and supported by VMS Software Inc. (VSI). OpenVMS offers high availability through clustering ? the ability to distribute the system over multiple physical machines. This allows clustered applications and data to remain continuously available while operating system software and hardware maintenance and upgrades are performed, or if part of the cluster is destroyed. VMS cluster uptimes of 17 years have been reported.



Operating System Projects

OSP, an Environment for Operating System Projects, is a teaching operating system designed to provide an environment for an introductory course in operating systems. By selectively omitting specific modules of the operating system and having the students re-implement the missing functionality, an instructor can generate projects that require students to understand fundamental operating system concepts.



Operating environment

In computer software, an operating environment or integrated applications environment is the environment in which users run application software. The environment consists of a user interface provided by an applications manager and usually an application programming interface (API) to the applications manager.



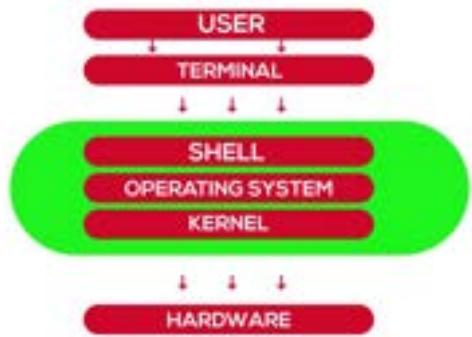
Operating system

An operating system (OS) is system software that manages computer hardware and software resources, and provides common services for computer programs.



Operating system abstraction layer

An operating system abstraction layer (OSAL) provides an application programming interface (API) to an abstract operating system making it easier and quicker to develop code for multiple software or hardware platforms.



Operations research

Operations research (British English: operational research) (U.S. Air Force Specialty Code: Operations Analysis), often shortened to the initialism OR, is a discipline that deals with the development and application of analytical methods to improve decision-making. It is considered to be a subfield of mathematical sciences. The term management science is occasionally used as a synonym. Employing techniques from other mathematical sciences, such as modeling, statistics, and optimization, operations research arrives at optimal or near-optimal solutions to decision-making problems. Because of its emphasis on practical applications, operations research has overlapped with many other disciplines, notably industrial engineering. Operations research is often concerned with determining the extreme values of some real-world objective: the maximum (of profit, performance, or yield) or minimum (of loss, risk, or cost). Originating in military efforts before World War II, its techniques have grown to concern problems in a variety of industries.



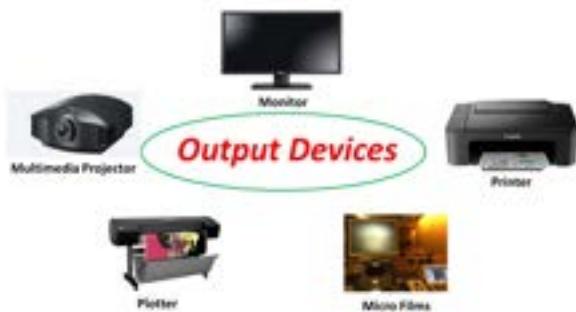
Outline of computer science

Computer science (also called computing science) is the study of the theoretical foundations of information and computation and their implementation and application in computer systems. One well known subject classification system for computer science is the ACM Computing Classification System devised by the Association for Computing Machinery.



Output device

An output device is any piece of computer hardware that converts information into a human-perceptible form or, historically, into a physical machine-readable form for use with other non-computerized equipment. It can be text, graphics, tactile, audio, or video. Examples include monitors, printers, speakers, headphones, projectors, GPS devices, optical mark readers, and braille readers.



P-code machine

In computer programming, a p-code machine (portable code machine) is a virtual machine designed to execute p-code (the assembly language or machine code of a hypothetical central processing unit (CPU)). This term is applied both generically to all such machines (such as the Java virtual machine (JVM) and MATLAB precompiled code), and to specific implementations, the most famous being the p-Machine of the Pascal-P system, particularly the UCSD Pascal implementation, among whose developers, the p in p-code was construed to mean pseudo more often than portable, thus pseudo-code meaning instructions for a pseudo-machine.



PC DOS

IBM PC DOS (also known as simply IBM DOS), an acronym for IBM Personal Computer Disk Operating System, is a discontinued disk operating system for the IBM Personal Computer, its successors, and IBM PC compatibles. It was manufactured and sold by IBM from the early 1980s into the 2000s. Developed by Microsoft, it was also sold by that company as MS-DOS. Both operating systems were identical or almost identical until 1993, when IBM began selling PC DOS 6.1 with new features. The collective shorthand for PC DOS and MS-DOS was DOS, which is also the generic term for disk operating system, and is shared with dozens of disk operating systems called DOS.



PDP-11

The PDP-11 is a series of 16-bit minicomputers sold by Digital Equipment Corporation (DEC) from 1970 into the late 1990s, one of a set of products in the Programmed Data Processor (PDP) series. In total, around 600,000 PDP-11s of all models were sold, making it one of DEC's most successful product lines. The PDP-11 is considered by some experts to be the most popular minicomputer. The PDP-11 included a number of innovative features in its instruction set and additional general-purpose registers that made it easier to program than earlier models in the PDP series. Further, the innovative Unibus system allowed external devices to be more easily interfaced to the system using direct memory access, opening the system to a wide variety of peripherals. The PDP-11 replaced the PDP-8 in many real-time computing applications, although both product lines lived in parallel for more than 10 years. The ease of programming of the PDP-11 made it popular for general-purpose computing.



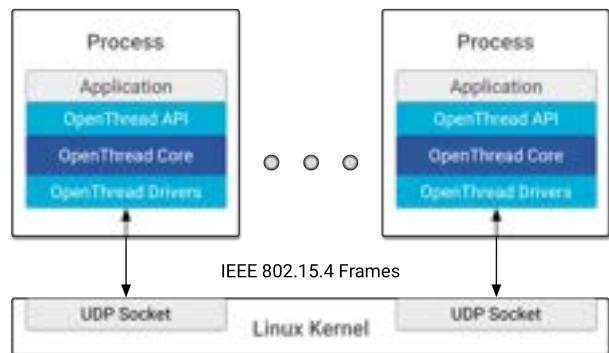
PLATO (computer system)

PLATO (Programmed Logic for Automatic Teaching Operations) was the first generalized computer-assisted instruction system. Starting in 1960, it ran on the University of Illinois' ILLIAC I computer. By the late 1970s, it supported several thousand graphics terminals distributed worldwide, running on nearly a dozen different networked mainframe computers. Many modern concepts in multi-user computing were originally developed on PLATO, including forums, message boards, online testing, e-mail, chat rooms, picture languages, instant messaging, remote screen sharing, and multiplayer video games.



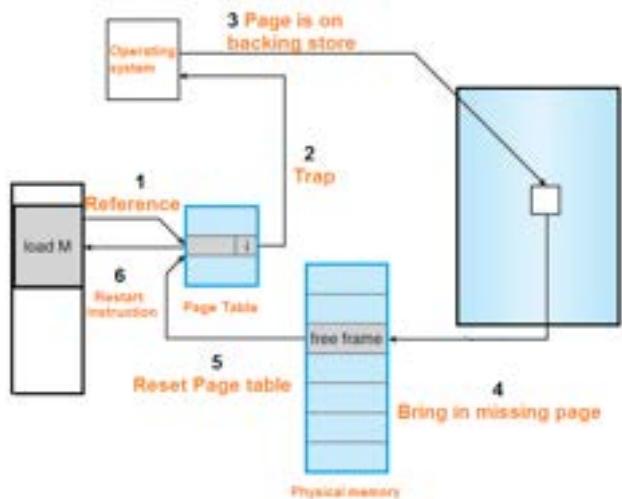
POSIX

The Portable Operating System Interface (POSIX, with pos pronounced as in positive, not as in pose) is a family of standards specified by the IEEE Computer Society for maintaining compatibility between operating systems. POSIX defines both the system and user-level application programming interfaces (APIs), along with command line shells and utility interfaces, for software compatibility (portability) with variants of Unix and other operating systems. POSIX is also a trademark of the IEEE. POSIX is intended to be used by both application and system developers.



Page fault

In computing, a page fault (sometimes called PF or hard fault) is an exception that the memory management unit (MMU) raises when a process accesses a memory page without proper preparations. Accessing the page requires a mapping to be added to the process's virtual address space. Besides, the actual page contents may need to be loaded from a backing store, such as a disk. The MMU detects the page fault, but the operating system's kernel handles the exception by making the required page accessible in the physical memory or denying an illegal memory access.



Paging

In computer operating systems, memory paging (or swapping on some Unix-like systems) is a memory management scheme by which a computer stores and retrieves data from secondary storage for use in main memory. In this scheme, the operating system retrieves data from secondary storage in same-size blocks called pages. Paging is an important part of virtual memory implementations in modern operating systems, using secondary storage to let programs exceed the size of available physical memory.



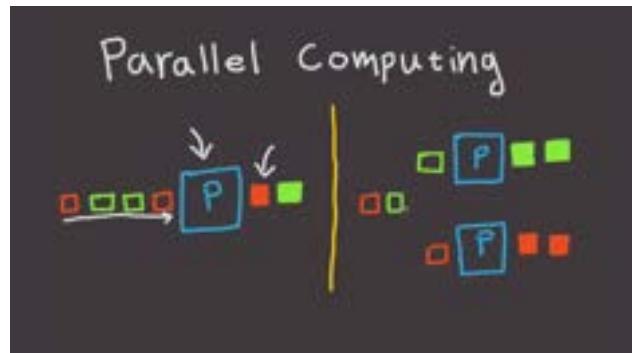
Palm OS

Palm OS (also known as Garnet OS) was a mobile operating system initially developed by Palm, Inc., for personal digital assistants (PDAs) in 1996. Palm OS was designed for ease of use with a touchscreen-based graphical user interface. It is provided with a suite of basic applications for personal information management. Later versions of the OS have been extended to support smartphones. The software appeared on the company's line of Palm devices while several other licensees have manufactured devices powered by Palm OS.



Parallel computing

Parallel computing is a type of computation in which many calculations or processes are carried out simultaneously. Large problems can often be divided into smaller ones, which can then be solved at the same time. There are several different forms of parallel computing: bit-level, instruction-level, data, and task parallelism. Parallelism has long been employed in high-performance computing, but has gained broader interest due to the physical constraints preventing frequency scaling. As power consumption (and consequently heat generation) by computers has become a concern in recent years, parallel computing has become the dominant paradigm in computer architecture, mainly in the form of multi-core processors. Parallel computing is closely related to concurrent computing; they are frequently used together, and often conflated, though the two are distinct: it is possible to have parallelism without concurrency, and concurrency without parallelism (such as multitasking by time-sharing on a single-core CPU). In parallel computing, a computational task is typically broken down into several, often many, very similar sub-tasks that can be processed independently and whose results are combined afterwards, upon completion. In contrast, in concurrent computing, the various processes often do not address related tasks; when they do, as is typical in distributed computing, the separate tasks may have a varied nature and often require some inter-process communication during execution.



Penguin

Penguins (order Sphenisciformes , family Spheniscidae) are a group of aquatic flightless birds. They live almost exclusively in the Southern Hemisphere: only one species, the Galapagos penguin, is found north of the Equator. Highly adapted for life in the water, penguins have countershaded dark and white plumage and flippers for swimming. Most penguins feed on krill, fish, squid and other forms of sea life which they catch with their bills and swallow whole while swimming. A penguin has a spiny tongue and powerful jaws to grip slippery prey. They spend roughly half of their lives on land and the other half in the sea. The largest living species is the emperor penguin (*Aptenodytes forsteri*): on average, adults are about 1.1 m (3 ft 7 in) tall and weigh 35 kg (77 lb). The smallest penguin species is the little blue penguin (*Eudyptula minor*), also known as the fairy penguin, which stands around 30?33 cm (12?13 in) tall and weighs 1.2?1.3 kg (2.6?2.9 lb). Today, larger penguins generally inhabit colder regions, and smaller penguins inhabit regions with temperate or tropical climates. Some prehistoric penguin species were enormous: as tall or heavy as an adult human. There was a great diversity of species in subantarctic regions, and at least one giant species in a region around 2,000 km south of the equator 35 mya, during the Late Eocene, a climate decidedly warmer than today.



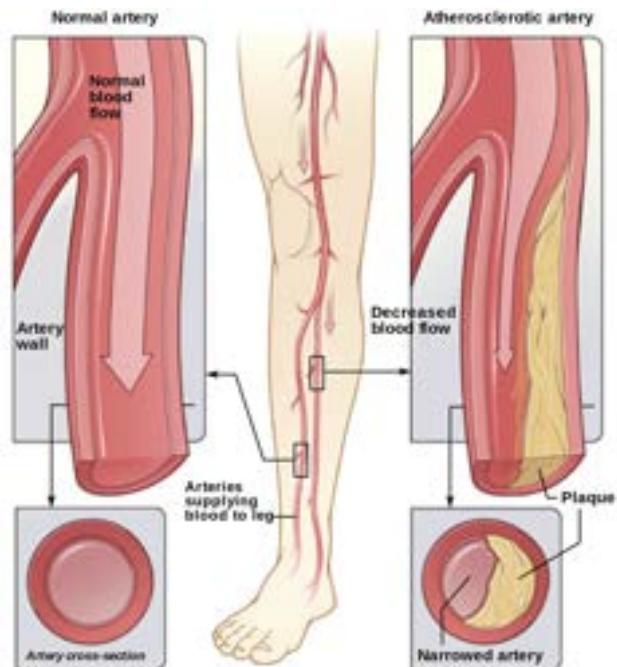
Per Brinch Hansen

Per Brinch Hansen (13 November 1938 – 31 July 2007) was a Danish-American computer scientist known for his work in operating systems, concurrent programming and parallel and distributed computing.



Peripheral

A peripheral device or peripheral is an auxiliary hardware device used to transfer information into and out of a computer. The term peripheral device refers to all hardware components that are attached to a computer and are controlled by the computer system, but they are not the core components of the computer.



Personal computer

A personal computer (PC) is a multi-purpose microcomputer whose size, capabilities, and price make it feasible for individual use. Personal computers are intended to be operated directly by an end user, rather than by a computer expert or technician. Unlike large, costly minicomputers and mainframes, time-sharing by many people at the same time is not used with personal computers. Primarily in the late 1970s and 1980s, the term home computer was also used.



Personal computer hardware

Computer hardware includes the physical parts of a computer, such as the case, central processing unit (CPU), random access memory (RAM), monitor, mouse, keyboard, computer data storage, graphics card, sound card, speakers and motherboard. By contrast, software is the set of instructions that can be stored and run by hardware. Hardware is so-termed because it is "hard" or rigid with respect to changes, whereas software is "soft" because it is easy to change.



Personal digital assistant

A personal digital assistant (PDA), also known as a handheld PC, is a variety mobile device which functions as a personal information manager. PDAs have been mostly displaced by the widespread adoption of highly capable smartphones, in particular those based on iOS and Android, seeing a rapid decline in use after 2007. A PDA has an electronic visual display. Most models also have audio capabilities, allowing usage as a portable media player, and also enabling many of them to be used as telephones. By the early 2000's, nearly all PDA models had the ability access the Internet, intranets or extranets via Wi-Fi or Wireless WANs, and generally include a web browser. Sometimes, instead of buttons, PDAs employ touchscreen technology.



Peter Senge

Peter Michael Senge (born 1947) is an American systems scientist who is a senior lecturer at the MIT Sloan School of Management, co-faculty at the New England Complex Systems Institute, and the founder of the Society for Organizational Learning. He is known as the author of the book *The Fifth Discipline: The Art and Practice of the Learning Organization* (1990, rev. 2006).



Philosophy of artificial intelligence

The philosophy of artificial intelligence is a branch of the philosophy of technology that explores artificial intelligence and its implications for knowledge and understanding of intelligence, ethics, consciousness, epistemology, and free will. Furthermore, the technology is concerned with the creation of artificial animals or artificial people (or, at least, artificial creatures; see artificial life) so the discipline is of considerable interest to philosophers. These factors contributed to the emergence of the philosophy of artificial intelligence. Some scholars argue that the AI community's dismissal of philosophy is detrimental. The philosophy of artificial intelligence attempts to answer such questions as follows:

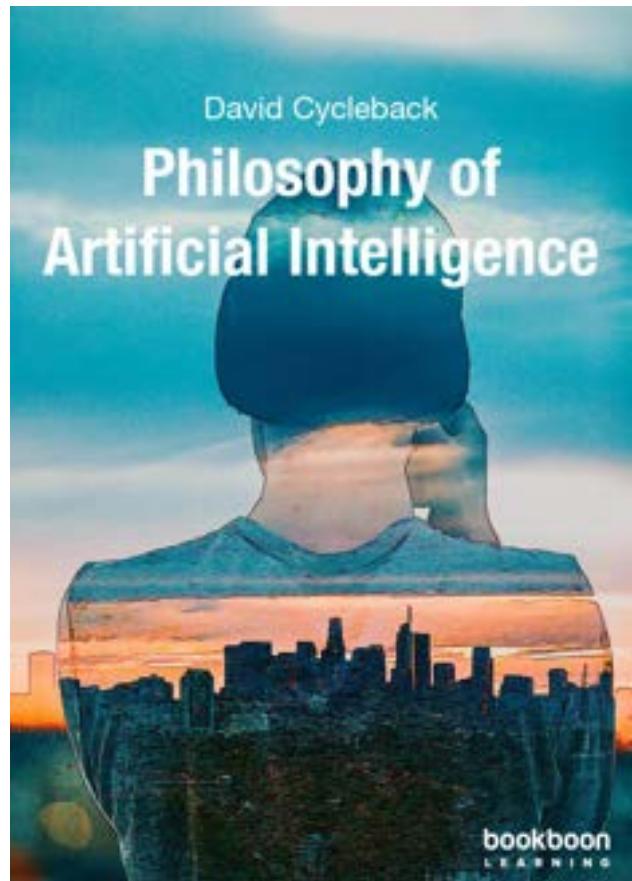


Photo manipulation

Photograph manipulation involves the transformation or alteration of a photograph. Some photograph manipulations are considered to be skillful artwork, while others are considered to be unethical practices, especially when used to deceive. Photographs may be manipulated for political propaganda, to improve the appearance of a subject, for entertainment, or as humor.



PikeOS

PikeOS is a commercial, hard real-time operating system (RTOS) that offers a separation kernel based hypervisor with multiple logical partition types for many other operating systems (OS), each called a GuestOS, and applications. It enables users to build certifiable smart devices for the Internet of things (IoT) according to the high quality, safety and security standards of different industries. For safety and security critical real-time applications on controller-based systems without memory management unit (MMU) but with memory protection unit (MPU) PikeOS for MPU is available.



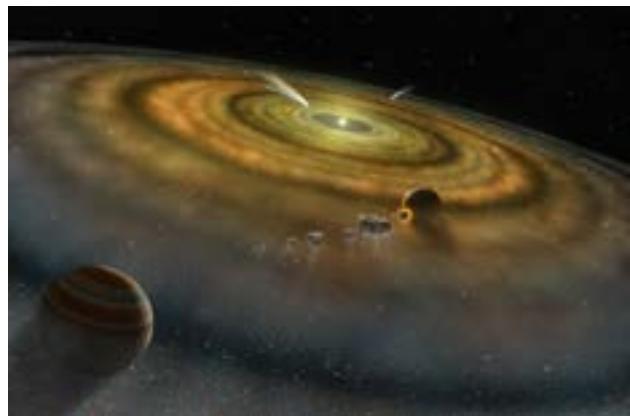
Plan 9 from Bell Labs

Plan 9 from Bell Labs is a distributed operating system which originated from the Computing Science Research Center (CSRC) at Bell Labs in the mid-1980s and built on UNIX concepts first developed there in the late 1960s. Since 2000, Plan 9 has been free and open-source. The final official release was in early 2015.



Planetary system

A planetary system is a set of gravitationally bound non-stellar objects in or out of orbit around a star or star system. Generally speaking, systems with one or more planets constitute a planetary system, although such systems may also consist of bodies such as dwarf planets, asteroids, natural satellites, meteoroids, comets, planetesimals and circumstellar disks. The Sun together with the planetary system revolving around it, including Earth, forms the Solar System. The term exoplanetary system is sometimes used in reference to other planetary systems.



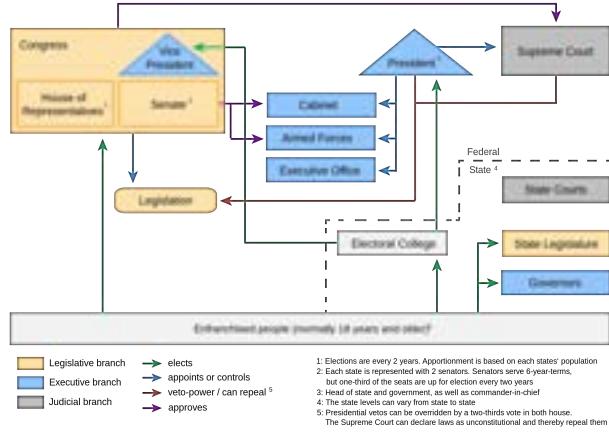
Plugboard

A plugboard or control panel (the term used depends on the application area) is an array of jacks or sockets (often called hubs) into which patch cords can be inserted to complete an electrical circuit. Control panels are sometimes used to direct the operation of unit record equipment, cipher machines, and early computers.



Political system

In political science, a political system means the type of political organization that can be recognized, observed or otherwise declared by a state. It defines the process for making official government decisions. It usually comprises the governmental legal and economic system, social and cultural system, and other state and government specific systems. However, this is a very simplified view of a much more complex system of categories involving the questions of who should have authority and what the government influence on its people and economy should be.



Polling (computer science)

Polling, or polled operation, in computer science, refers to actively sampling the status of an external device by a client program as a synchronous activity. Polling is most often used in terms of input/output (I/O), and is also referred to as polled I/O or software-driven I/O. A good example of hardware implementation is a watchdog timer.

Polling (computer
science)

Popek and Goldberg virtualization requirements

The Popek and Goldberg virtualization requirements are a set of conditions sufficient for a computer architecture to support system virtualization efficiently. They were introduced by Gerald J. Popek and Robert P. Goldberg in their 1974 article "Formal Requirements for Virtualizable Third Generation Architectures". Even though the requirements are derived under simplifying assumptions, they still represent a convenient way of determining whether a computer architecture supports efficient virtualization and provide guidelines for the design of virtualized computer architectures.



Ported

In software engineering, porting is the process of adapting software for the purpose of achieving some form of execution in a computing environment that is different from the one that a given program (meant for such execution) was originally designed for (e.g., different CPU, operating system, or third party library). The term is also used when software/hardware is changed to make them usable in different environments. Software is portable when the cost of porting it to a new platform is significantly less than the cost of writing it from scratch. The lower the cost of porting software relative to its implementation cost, the more portable it is said to be.



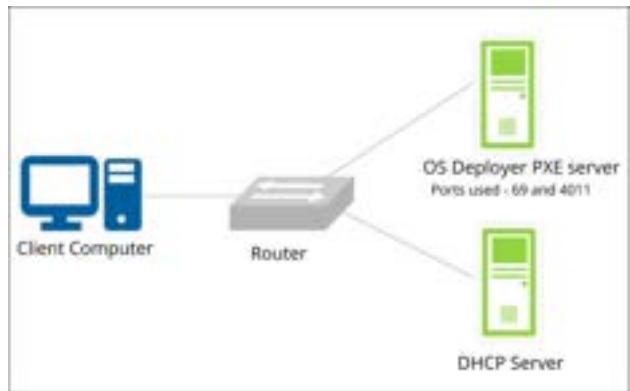
Positive feedback

Positive feedback (exacerbating feedback, self-reinforcing feedback) is a process that occurs in a feedback loop which exacerbates the effects of a small disturbance. That is, the effects of a perturbation on a system include an increase in the magnitude of the perturbation. That is, A produces more of B which in turn produces more of A. In contrast, a system in which the results of a change act to reduce or counteract it has negative feedback. Both concepts play an important role in science and engineering, including biology, chemistry, and cybernetics.



Preboot Execution Environment

In computing, the Preboot eXecution Environment, PXE (most often pronounced as pixie, often called PXE Boot/pixie boot.) specification describes a standardized client?server environment that boots a software assembly, retrieved from a network, on PXE-enabled clients. On the client side it requires only a PXE-capable network interface controller (NIC), and uses a small set of industry-standard network protocols such as DHCP and TFTP.



Preemption (computing)

In computing, preemption is the act of temporarily interrupting an executing task, with the intention of resuming it at a later time. This interrupt is done by an external scheduler with no assistance or cooperation from the task.¹⁵³ This preemptive scheduler usually runs in the most privileged protection ring, meaning that interruption and resuming are considered highly secure actions. Such a change in the currently executing task of a processor is known as context switching.



Preemptive multitasking

In computing, preemption is the act of temporarily interrupting an executing task, with the intention of resuming it at a later time. This interrupt is done by an external scheduler with no assistance or cooperation from the task.¹⁵³ This preemptive scheduler usually runs in the most privileged protection ring, meaning that interruption and resuming are considered highly secure actions. Such a change in the currently executing task of a processor is known as context switching.

PREEMPTIVE MULTITASKING VERSUS COOPERATIVE MULTITASKING

PREEMPTIVE MULTITASKING

Task in which a computer operating system uses to decide for how long to execute a task before giving another task to use the operating system

Interrupts applications and gives control to other processes outside the application's control

UNIX, Windows 95, Windows NT are some examples for operating systems with preemptive multitasking

COOPERATIVE MULTITASKING

Type of computer multitasking in which the operating system never initiates a context switch from a running process to another process

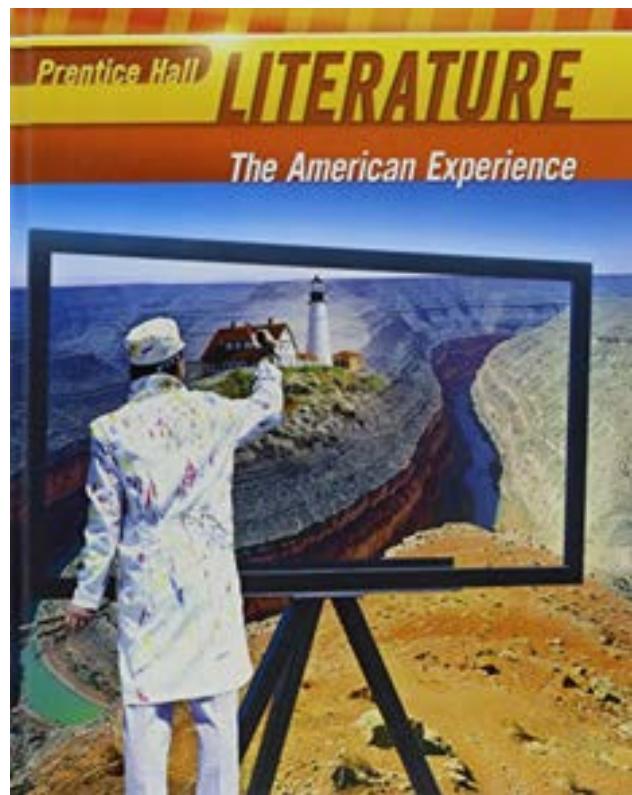
Process scheduler never interrupts a process unexpectedly

Macintosh OS version 8.0.9.2.2 and Windows 3.x operating systems are based on cooperative multitasking

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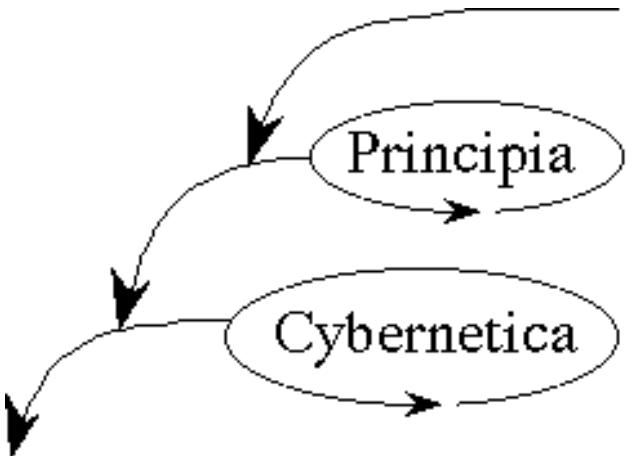
Prentice Hall

Prentice Hall was an American major educational publisher owned by Sawas Learning Company. Prentice Hall publishes print and digital content for the 6?12 and higher-education market, and distributes its technical titles through the Safari Books Online e-reference service.



Principia Cybernetica

Principia Cybernetica is an international cooperation of scientists in the field of cybernetics and systems science, especially known for their website, Principia Cybernetica. They have dedicated their organization to what they call "a computer-supported evolutionary-systemic philosophy, in the context of the transdisciplinary academic fields of Systems Science and Cybernetics".



Printed circuit board

A printed circuit board (PCB; also printed wiring board or PWB) is a medium used in electrical and electronic engineering to connect electronic components to one another in a controlled manner. It takes the form of a laminated sandwich structure of conductive and insulating layers: each of the conductive layers is designed with an artwork pattern of traces, planes and other features (similar to wires on a flat surface) etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate. Electrical components may be fixed to conductive pads on the outer layers in the shape designed to accept the component's terminals, generally by means of soldering, to both electrically connect and mechanically fasten them to it. Another manufacturing process adds vias: plated-through holes that allow interconnections between layers.



Printer (computing)

In computing, a printer is a peripheral machine which makes a persistent representation of graphics or text, usually on paper. While most output is human-readable, bar code printers are an example of an expanded use for printers. Different types of printers include 3D printers, inkjet printers, laser printers, and thermal printers.



Probability

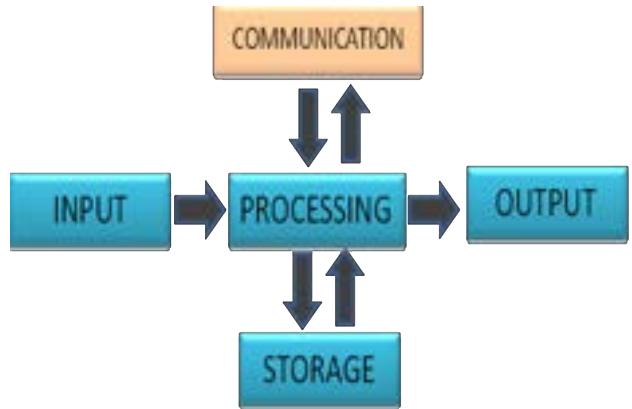
In science, the probability of an event is a number that indicates how likely the event is to occur. It is expressed as a number in the range from 0 and 1, or, using percentage notation, in the range from 0% to 100%.

The more likely it is that the event will occur, the higher its probability. The probability of an impossible event is 0; that of an event that is certain to occur is 1. The probabilities of two complementary events A and B ? either A occurs or B occurs ? add up to 1. A simple example is the tossing of a fair (unbiased) coin. If a coin is fair, the two possible outcomes ("heads" and "tails") are equally likely; since these two outcomes are complementary and the probability of "heads" equals the probability of "tails", the probability of each of the two outcomes equals 1/2 (which could also be written as 0.5 or 50%).



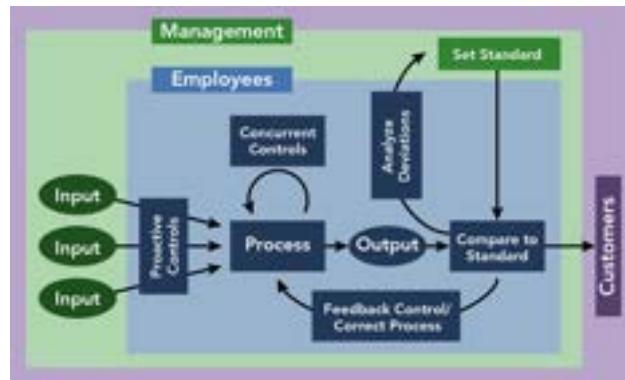
Process (computing)

In computing, a process is the instance of a computer program that is being executed by one or many threads. There are many different process models, some of which are light weight, but almost all processes (even entire virtual machines) are rooted in an operating system (OS) process which comprises the program code, assigned system resources, physical and logical access permissions, and data structures to initiate, control and coordinate execution activity. Depending on the OS, a process may be made up of multiple threads of execution that execute instructions concurrently. While a computer program is a passive collection of instructions typically stored in a file on disk, a process is the execution of those instructions after being loaded from the disk into memory. Several processes may be associated with the same program; for example, opening up several instances of the same program often results in more than one process being executed.



Process control

An industrial process control in continuous production processes is a discipline that uses industrial control systems to achieve a production level of consistency, economy and safety which could not be achieved purely by human manual control. It is implemented widely in industries such as automotive, mining, dredging, oil refining, pulp and paper manufacturing, chemical processing and power generating plants. There is a wide range of size, type and complexity, but it enables a small number of operators to manage complex processes to a high degree of consistency. The development of large industrial process control systems was instrumental in enabling the design of large high volume and complex processes, which could not be otherwise economically or safely operated. The applications can range from controlling the temperature and level of a single process vessel, to a complete chemical processing plant with several thousand control loops.



Process control block

A process control block (PCB) is a data structure used by computer operating systems to store all the information about a process.

Pointer to the process parent	Process State
Pointer to the process child	Process State
Process Identification Number	
Process Priority	
Program Counter	
Registers	
Pointers to Process Memory	
Memory Limits	
List of open Files	
* * *	

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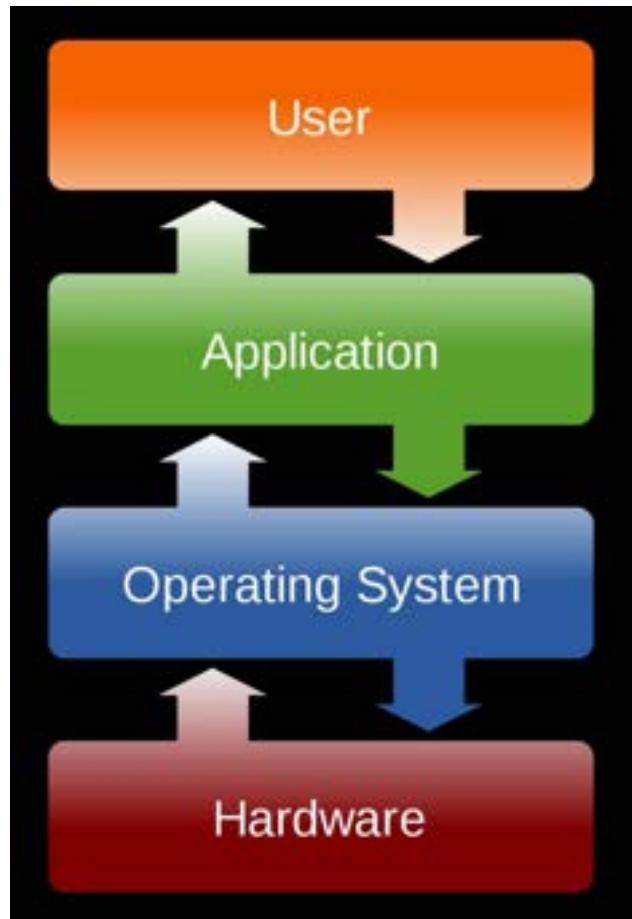
Process identifier

In computing, the process identifier (a.k.a. process ID or PID) is a number used by most operating system kernels such as those of Unix, macOS and Windows to uniquely identify an active process. This number may be used as a parameter in various function calls, allowing processes to be manipulated, such as adjusting the process's priority or killing it altogether.



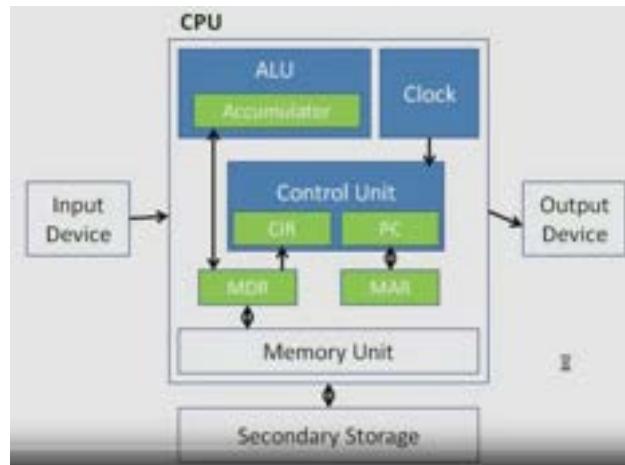
Process management (computing)

A process is a program in execution, and an integral part of any modern-day operating system (OS). The OS must allocate resources to processes, enable processes to share and exchange information, protect the resources of each process from other processes and enable synchronization among processes. To meet these requirements, the OS must maintain a data structure for each process, which describes the state and resource ownership of that process, and which enables the OS to exert control over each process.



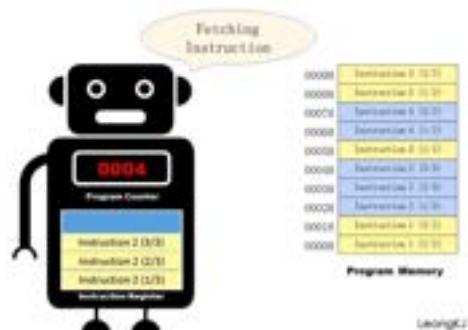
Processor register

A processor register is a quickly accessible location available to a computer's processor. Registers usually consist of a small amount of fast storage, although some registers have specific hardware functions, and may be read-only or write-only. In computer architecture, registers are typically addressed by mechanisms other than main memory, but may in some cases be assigned a memory address e.g. DEC PDP-10, ICT 1900. Almost all computers, whether load/store architecture or not, load data from a larger memory into registers where it is used for arithmetic operations and is manipulated or tested by machine instructions. Manipulated data is then often stored back to main memory, either by the same instruction or by a subsequent one. Modern processors use either static or dynamic RAM as main memory, with the latter usually accessed via one or more cache levels.



Program counter

The program counter (PC), commonly called the instruction pointer (IP) in Intel x86 and Itanium microprocessors, and sometimes called the instruction address register (IAR), the instruction counter, or just part of the instruction sequencer, is a processor register that indicates where a computer is in its program sequence. Usually, the PC is incremented after fetching an instruction, and holds the memory address of ("points to") the next instruction that would be executed. Processors usually fetch instructions sequentially from memory, but control transfer instructions change the sequence by placing a new value in the PC. These include branches (sometimes called jumps), subroutine calls, and returns. A transfer that is conditional on the truth of some assertion lets the computer follow a different sequence under different conditions.



Programmable Interrupt Controller

In computing, a programmable interrupt controller (PIC) is an integrated circuit that helps a microprocessor (or CPU) handle interrupt requests (IRQ) coming from multiple different sources (like external I/O devices) which may occur simultaneously. It helps prioritize IRQs so that the CPU switches execution to the most appropriate interrupt handler (ISR) after the PIC assesses the IRQ's relative priorities. Common modes of interrupt priority include hard priorities, rotating priorities, and cascading priorities. PICs often allow mapping input to outputs in a configurable way. On the PC architecture PIC are typically embedded into a southbridge chip whose internal architecture is defined by the chipset vendor's standards.



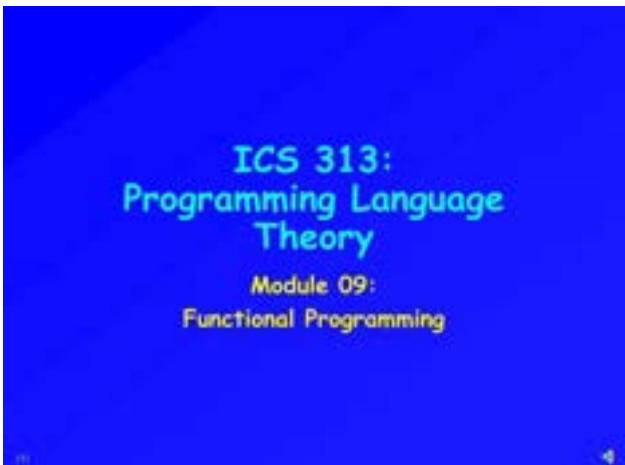
Programming language

A programming language is a system of notation for writing computer programs. Most programming languages are text-based formal languages, but they may also be graphical. They are a kind of computer language.



Programming language theory

Programming language theory (PLT) is a branch of computer science that deals with the design, implementation, analysis, characterization, and classification of formal languages known as programming languages. Programming language theory is closely related to other fields including mathematics, software engineering, and linguistics. There are a number of academic conferences and journals in the area.



Programming paradigm

Programming paradigms are a way to classify programming languages based on their features. Languages can be classified into multiple paradigms.



Programming team

A programming team is a team of people who develop or maintain computer software. They may be organised in numerous ways, but the egoless programming team and chief programmer team have been common structures.



Programming tool

A programming tool or software development tool is a computer program that software developers use to create, debug, maintain, or otherwise support other programs and applications. The term usually refers to relatively simple programs, that can be combined to accomplish a task, much as one might use multiple hands to fix a physical object. The most basic tools are a source code editor and a compiler or interpreter, which are used ubiquitously and continuously. Other tools are used more or less depending on the language, development methodology, and individual engineer, often used for a discrete task, like a debugger or profiler. Tools may be discrete programs, executed separately ? often from the command line ? or may be parts of a single large program, called an integrated development environment (IDE). In many cases, particularly for simpler use, simple ad hoc techniques are used instead of a tool, such as print debugging instead of using a debugger, manual timing (of overall program or section of code) instead of a profiler, or tracking bugs in a text file or spreadsheet instead of a bug tracking system.



Proprietary software

Proprietary software is software that is deemed within the free and open-source software community to be non-free because its creator, publisher, or other rightsholder or rightsholder partner exercises a legal monopoly by modern copyright and intellectual property law to exclude the recipient from freely sharing the software or modifying it, and?in some cases, as is the case with some patent-encumbered and EULA-bound software?from making use of the software on their own, thereby restricting their freedoms. It is often contrasted with open-source or free software. For this reason, it is also known as non-free software or closed-source software.



Protected mode

In computing, protected mode, also called protected virtual address mode, is an operational mode of x86-compatible central processing units (CPUs). It allows system software to use features such as virtual memory, paging and safe multi-tasking designed to increase an operating system's control over application software. When a processor that supports x86 protected mode is powered on, it begins executing instructions in real mode, in order to maintain backward compatibility with earlier x86 processors. Protected mode may only be entered after the system software sets up one descriptor table and enables the Protection Enable (PE) bit in the control register 0 (CR0). Protected mode was first added to the x86 architecture in 1982, with the release of Intel's 80286 (286) processor, and later extended with the release of the 80386 (386) in 1985. Due to the enhancements added by protected mode, it has become widely adopted and has become the foundation for all subsequent enhancements to the x86 architecture, although many of those enhancements, such as added instructions and new registers, also brought benefits to the real mode.



Protection ring

In computer science, hierarchical protection domains, often called protection rings, are mechanisms to protect data and functionality from faults (by improving fault tolerance) and malicious behavior (by providing computer security).



Punched tape

Punched tape or perforated paper tape is a form of data storage that consists of a long strip of paper in which holes are punched. It developed from and was subsequently used alongside punched cards, differing in that the tape is continuous.



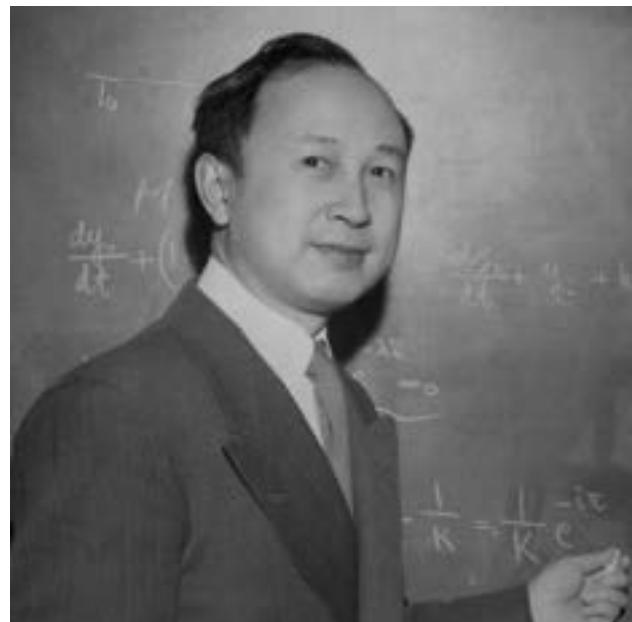
QNX

QNX (or) is a commercial Unix-like real-time operating system, aimed primarily at the embedded systems market. QNX was one of the first commercially successful microkernel operating systems. The product was originally developed in the early 1980s by Canadian company Quantum Software Systems, later renamed QNX Software Systems.



Qian Xuesen

Qian Xuesen, or Hsue-Shen Tsien (Chinese: 钱学森; 11 December 1911 – 31 October 2009), was a Chinese aerospace engineer, astrodynamics scientist, physicist, and cyberneticist who made significant contributions to the field of aerodynamics and established engineering cybernetics.



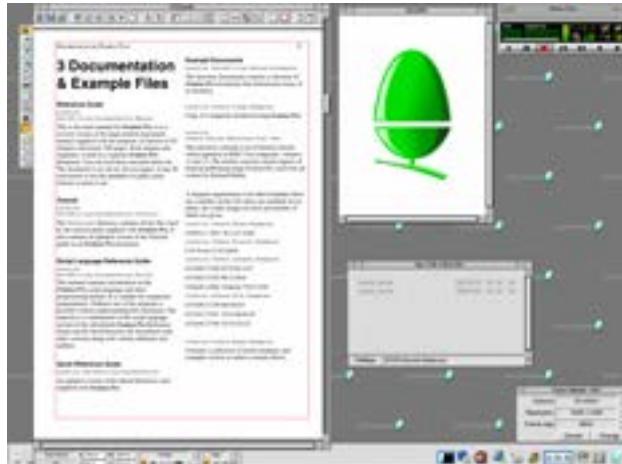
Qt (software)

Qt (pronounced "cute") is cross-platform software for creating graphical user interfaces as well as cross-platform applications that run on various software and hardware platforms such as Linux, Windows, macOS, Android or embedded systems with little or no change in the underlying codebase while still being a native application with native capabilities and speed.



RISC OS

RISC OS is a computer operating system originally designed by Acorn Computers Ltd in Cambridge, England. First released in 1987, it was designed to run on the ARM chipset, which Acorn had designed concurrently for use in its new line of Archimedes personal computers. RISC OS takes its name from the reduced instruction set computer (RISC) architecture it supports.



RSX-11

RSX-11 is a discontinued family of multi-user real-time operating systems for PDP-11 computers created by Digital Equipment Corporation. In widespread use through the late 1970s and early 1980s, RSX-11 was influential in the development of later operating systems such as VMS and Windows NT.



RT-11

RT-11 (Real-time 11) is a discontinued small, low-end, single-user real-time operating system for the full line of Digital Equipment Corporation PDP-11 16-bit computers. RT-11 was first implemented in 1970. It was widely used for real-time computing systems, process control, and data acquisition across all PDP-11s. It was also used for low-cost general-use computing.



RTLinux

RTLinux is a hard realtime real-time operating system (RTOS) microkernel that runs the entire Linux operating system as a fully preemptive process. The hard real-time property makes it possible to control robots, data acquisition systems, manufacturing plants, and other time-sensitive instruments and machines from RTLinux applications.

The design was patented. Despite the similar name, it is not related to the Real-Time Linux project of the Linux Foundation. RTLinux was developed by Victor Yodaiken, Michael Barabanov, Cort Dougan and others at the New Mexico Institute of Mining and Technology and then as a commercial product at FSMLabs. Wind River Systems acquired FSMLabs embedded technology in February 2007 and made a version available as Wind River Real-Time Core for Wind River Linux. As of August 2011, Wind River has discontinued the Wind River Real-Time Core product line, effectively ending commercial support for the RTLinux product.

The logo for RTLinux consists of the word "RTLinux" in a bold, black, sans-serif font. The letters are slightly slanted to the right. The "R" and "T" are connected by a vertical stroke, and the "L" and "i" are also connected by a vertical stroke. The "n" and "u" are also connected by a vertical stroke. The "x" is a standard "x" shape. The entire word is contained within a light gray rectangular box with rounded corners.

Radhika Nagpal

Radhika Nagpal is an American computer scientist and researcher in the fields of self-organising computer systems, biologically-inspired robotics, and biological multi-agent systems. She is the Fred Kavli Professor of Computer Science at Harvard University and the Harvard School of Engineering and Applied Sciences. She is also a Core Faculty Member of the Harvard Wyss Institute for Biologically Inspired Engineering. In 2017, Nagpal co-founded a robotics company under the name of Root Robotics. This educational company works to create many different opportunities for those unable to code to learn how.



Random access memory

Random-access memory (RAM;) is a form of computer memory that can be read and changed in any order, typically used to store working data and machine code. A random-access memory device allows data items to be read or written in almost the same amount of time irrespective of the physical location of data inside the memory, in contrast with other direct-access data storage media (such as hard disks, CD-RWs, DVD-RWs and the older magnetic tapes and drum memory), where the time required to read and write data items varies significantly depending on their physical locations on the recording medium, due to mechanical limitations such as media rotation speeds and arm movement.



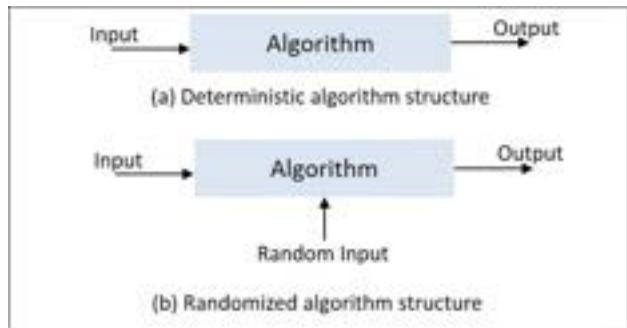
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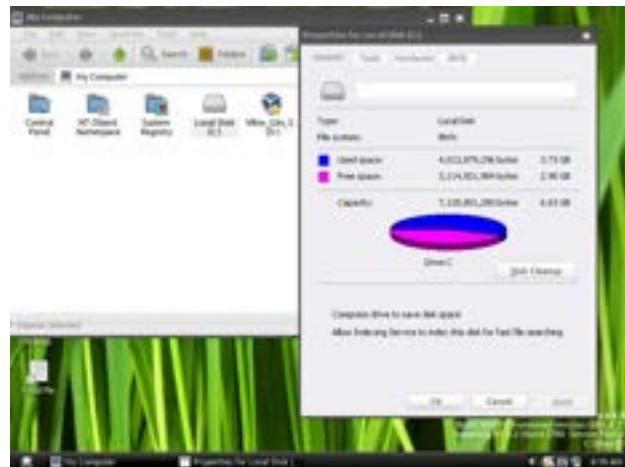
Randomized algorithm

A randomized algorithm is an algorithm that employs a degree of randomness as part of its logic or procedure. The algorithm typically uses uniformly random bits as an auxiliary input to guide its behavior, in the hope of achieving good performance in the "average case" over all possible choices of random determined by the random bits; thus either the running time, or the output (or both) are random variables.



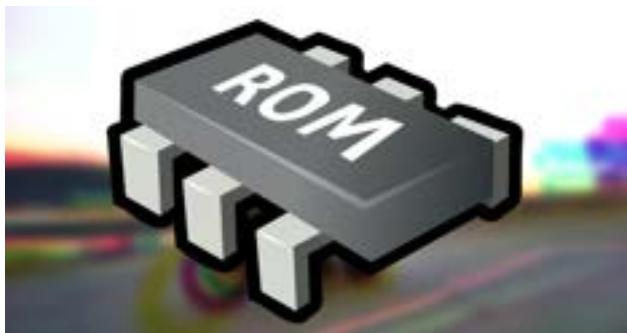
ReactOS

ReactOS is a free and open-source operating system for amd64/i686 personal computers intended to be binary-compatible with computer programs and device drivers made for Windows Server 2003 and later versions of Windows. ReactOS has been noted as a potential open-source drop-in replacement for Windows and for its information on undocumented Windows APIs. ReactOS has been in development since 1996. As of February 2022, it is still considered feature-incomplete alpha software, and is therefore recommended by the developers only for evaluation and testing purposes. However, many Windows applications are currently working, such as Adobe Reader 9.3, GIMP 2.6, and LibreOffice 5.4. ReactOS is primarily written in C, with some elements, such as ReactOS File Explorer, written in C++. The project partially implements Windows API functionality and has been ported to the AMD64 processor architecture. ReactOS, as part of the FOSS ecosystem, re-uses and collaborates with many other FOSS projects, most notably the Wine project, which presents a Windows compatibility layer for Unix-like operating systems.



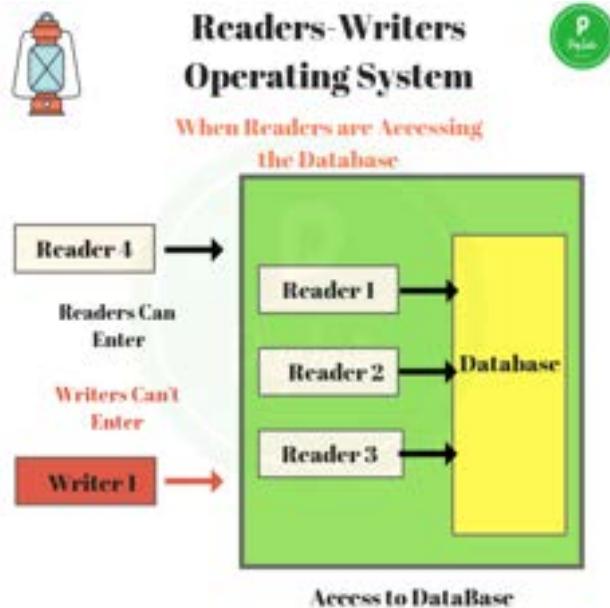
Read-only memory

Read-only memory (ROM) is a type of non-volatile memory used in computers and other electronic devices. Data stored in ROM cannot be electronically modified after the manufacture of the memory device. Read-only memory is useful for storing software that is rarely changed during the life of the system, also known as firmware. Software applications (like video games) for programmable devices can be distributed as plug-in cartridges containing ROM.



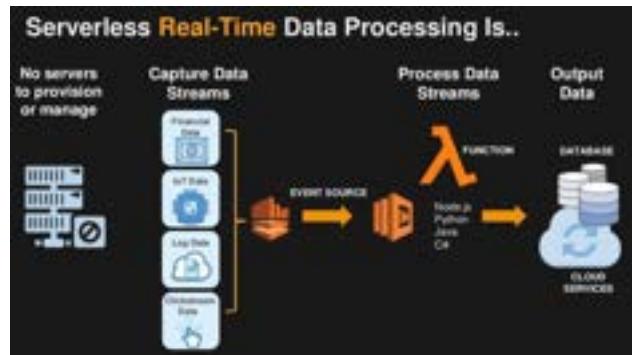
Readers?writers problem

In computer science, the readers?writers problems are examples of a common computing problem in concurrency. There are at least three variations of the problems, which deal with situations in which many concurrent threads of execution try to access the same shared resource at one time.



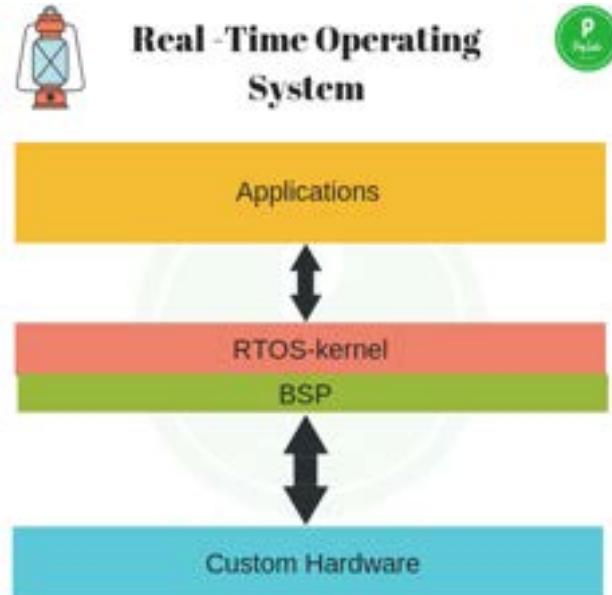
Real-time computing

Real-time computing (RTC) is the computer science term for hardware and software systems subject to a "real-time constraint", for example from event to system response. Real-time programs must guarantee response within specified time constraints, often referred to as "deadlines". Real-time responses are often understood to be in the order of milliseconds, and sometimes microseconds. A system not specified as operating in real time cannot usually guarantee a response within any timeframe, although typical or expected response times may be given. Real-time processing fails if not completed within a specified deadline relative to an event; deadlines must always be met, regardless of system load.



Real-time operating system

A real-time operating system (RTOS) is an operating system (OS) for real-time computing applications that processes data and events that have critically defined time constraints. An RTOS is distinct from a time-sharing operating system, such as Unix, which manages the sharing of system resources with a scheduler, data buffers, or fixed task prioritization in a multitasking or multiprogramming environment. Processing time requirements need to be fully understood and bound rather than just kept as a minimum. All processing must occur within the defined constraints. Real-time operating systems are event-driven and preemptive, meaning the OS can monitor the relevant priority of competing tasks, and make changes to the task priority. Event-driven systems switch between tasks based on their priorities, while time-sharing systems switch the task based on clock interrupts.



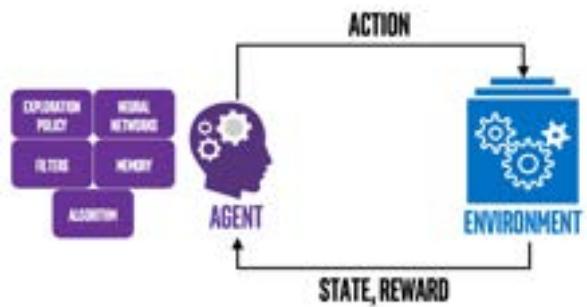
Red Hat Enterprise Linux

Red Hat Enterprise Linux (RHEL) is a commercial open-source Linux distribution developed by Red Hat for the commercial market. Red Hat Enterprise Linux is released in server versions for x86-64, Power ISA, ARM64, and IBM Z and a desktop version for x86-64. Fedora Linux serves as its upstream source. All of Red Hat's official support and training, together with the Red Hat Certification Program, focuses on the Red Hat Enterprise Linux platform.



Reinforcement learning

Reinforcement learning (RL) is an area of machine learning concerned with how intelligent agents ought to take actions in an environment in order to maximize the notion of cumulative reward. Reinforcement learning is one of three basic machine learning paradigms, alongside supervised learning and unsupervised learning.



Reiser4

Reiser4 is a computer file system, successor to the ReiserFS file system, developed from scratch by Namesys and sponsored by DARPA as well as Linspire. Reiser4 was named after its former lead developer Hans Reiser. As of 2021, the Reiser4 patch set is still being maintained, but according to Phoronix, it is unlikely to be merged into mainline Linux without corporate backing.



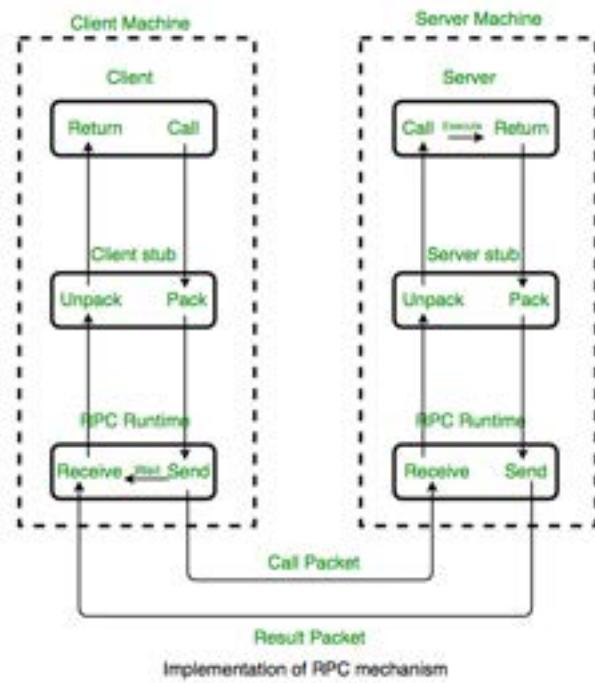
ReiserFS

ReiserFS is a general-purpose, journaling file system initially designed and implemented by a team at Namesys led by Hans Reiser and licensed under GPLv2. Introduced in version 2.4.1 of the Linux kernel, it was the first journaling file system to be included in the standard kernel. ReiserFS was the default file system in Novell's SUSE Linux Enterprise until Novell decided to move to ext3 on October 12, 2006, for future releases. Namesys considered ReiserFS version 3.6 which introduced a new on-disk format allowing bigger filesizes, now occasionally referred to as Reiser3, as stable and feature-complete and, with the exception of security updates and critical bug fixes, ceased development on it to concentrate on its successor, Reiser4. Namesys went out of business in 2008 after Reiser's conviction for murder. The product is now maintained as open source by volunteers. The reiserfsprogs 3.6.27 were released on 25 July 2017. ReiserFS is currently supported on Linux without quota support. It has been discussed for removal from the Linux kernel since early 2022 due to a lack of maintenance upstream, and technical issues inherent to the filesystem, such as the fact it suffers from the year 2038 problem; it was deprecated in Linux 5.18, with removal planned for 2025.



Remote procedure call

In distributed computing, a remote procedure call (RPC) is when a computer program causes a procedure (subroutine) to execute in a different address space (commonly on another computer on a shared network), which is coded as if it were a normal (local) procedure call, without the programmer explicitly coding the details for the remote interaction. That is, the programmer writes essentially the same code whether the subroutine is local to the executing program, or remote. This is a form of client?server interaction (caller is client, executor is server), typically implemented via a request?response message-passing system. In the object-oriented programming paradigm, RPCs are represented by remote method invocation (RMI). The RPC model implies a level of location transparency, namely that calling procedures are largely the same whether they are local or remote, but usually, they are not identical, so local calls can be distinguished from remote calls. Remote calls are usually orders of magnitude slower and less reliable than local calls, so distinguishing them is important.



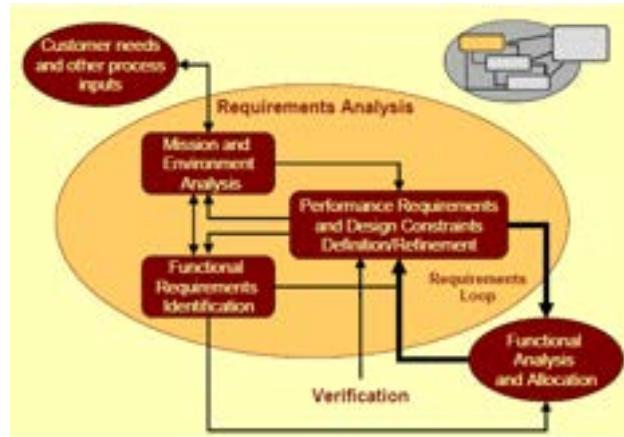
Rendering (computer graphics)

Rendering or image synthesis is the process of generating a photorealistic or non-photorealistic image from a 2D or 3D model by means of a computer program. The resulting image is referred to as the render. Multiple models can be defined in a scene file containing objects in a strictly defined language or data structure. The scene file contains geometry, viewpoint, texture, lighting, and shading information describing the virtual scene. The data contained in the scene file is then passed to a rendering program to be processed and output to a digital image or raster graphics image file. The term "rendering" is analogous to the concept of an artist's impression of a scene. The term "rendering" is also used to describe the process of calculating effects in a video editing program to produce the final video output.



Requirements analysis

In systems engineering and software engineering, requirements analysis focuses on the tasks that determine the needs or conditions to meet the new or altered product or project, taking account of the possibly conflicting requirements of the various stakeholders, analyzing, documenting, validating and managing software or system requirements. Requirements analysis is critical to the success or failure of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.



Resident monitor

In computing, a resident monitor is a type of system software program that was used in many early computers from the 1950s to 1970s. It can be considered a precursor to the operating system. The name is derived from a program which is always present in the computer's memory, thus being "resident". Because memory was very limited on those systems, the resident monitor was often little more than a stub that would gain control at the end of a job and load a non-resident portion to perform required job cleanup and setup tasks.



Richard E. Bellman

Richard Ernest Bellman (August 26, 1920 ? March 19, 1984) was an American applied mathematician, who introduced dynamic programming in 1953, and made important contributions in other fields of mathematics, such as biomathematics. He founded the leading biomathematical journal Mathematical Biosciences.



Richard Stallman

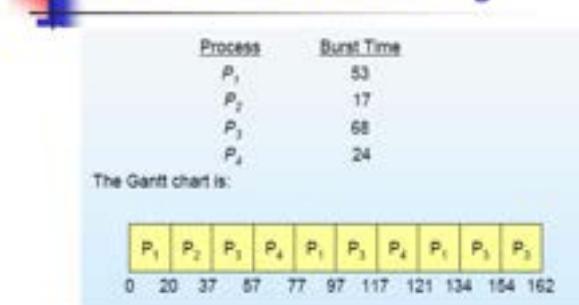
Richard Matthew Stallman (; born March 16, 1953), also known by his initials, rms, is an American free software movement activist and programmer. He campaigns for software to be distributed in such a manner that its users have the freedom to use, study, distribute, and modify that software. Software that ensures these freedoms is termed free software. Stallman launched the GNU Project, founded the Free Software Foundation (FSF) in October 1985, developed the GNU Compiler Collection and GNU Emacs, and wrote the GNU General Public License.



Round-robin scheduling

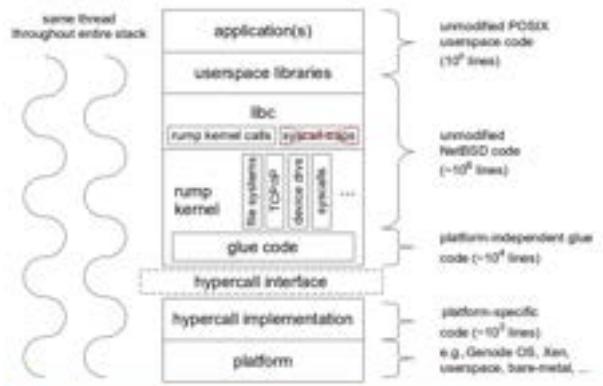
Round-robin (RR) is one of the algorithms employed by process and network schedulers in computing.

Round-Robin Scheduling



Rump kernel

The NetBSD rump kernel is the first implementation of the "anykernel" concept where drivers either can be compiled into or run in the monolithic kernel or in user space on top of a light-weight kernel.



Runtime library

In computer programming, a runtime library is a set of low-level routines used by a compiler to invoke some of the behaviors of a runtime environment, by inserting calls to the runtime library into compiled executable binary. The runtime environment implements the execution model, built-in functions, and other fundamental behaviors of a programming language. During execution (run time) of that computer program, execution of those calls to the runtime library cause communication between the executable binary and the runtime environment. A runtime library often includes built-in functions for memory management or exception handling. Therefore, a runtime library is always specific to the platform and compiler.



Russell L. Ackoff

Russell Lincoln Ackoff (February 12, 1919 ? October 29, 2009) was an American organizational theorist, consultant, and Anheuser-Busch Professor Emeritus of Management Science at the Wharton School, University of Pennsylvania. Ackoff was a pioneer in the field of operations research, systems thinking and management science.



Ruzena Bajcsy

Ruzena Bajcsy (born 1933 in Bratislava, now Slovakia) is an American engineer and computer scientist who specializes in robotics. She is professor of electrical engineering and computer science at the University of California, Berkeley, where she is also director emerita of CITRIS (the Center for Information Technology Research in the Interest of Society).



S2CID (identifier)

Semantic Scholar is an artificial intelligence-powered research tool for scientific literature developed at the Allen Institute for AI and publicly released in November 2015. It uses advances in natural language processing to provide summaries for scholarly papers. The Semantic Scholar team is actively researching the use of artificial-intelligence in natural language processing, machine learning, Human-Computer interaction, and information retrieval. Semantic Scholar began as a database surrounding the topics of computer science, geoscience, and neuroscience. However, in 2017 the system began including biomedical literature in its corpus. As of September 2022, they now include over 200 million publications from all fields of science.



SCOPE (software)

SCOPE (Supervisory Control of Program Execution) is a series of Control Data Corporation operating systems developed in the 1960s.



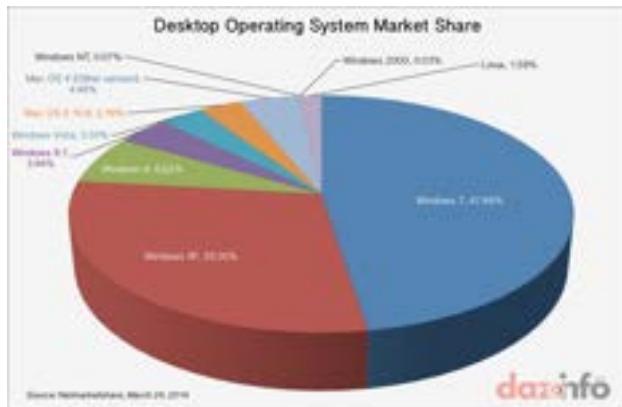
SCSI RDMA Protocol

In computing the SCSI RDMA Protocol (SRP) is a protocol that allows one computer to access SCSI devices attached to another computer via remote direct memory access (RDMA). The SRP protocol is also known as the SCSI Remote Protocol. The use of RDMA makes higher throughput and lower latency possible than what is generally available through e.g. the TCP/IP communication protocol.



SHARE Operating System

The SHARE Operating System (SOS) is an operating system introduced in 1959 by the SHARE user group. It is an improvement on the General Motors GM-NAA I/O operating system, the first operating system for the IBM 704. The main objective was to improve the sharing of programs.



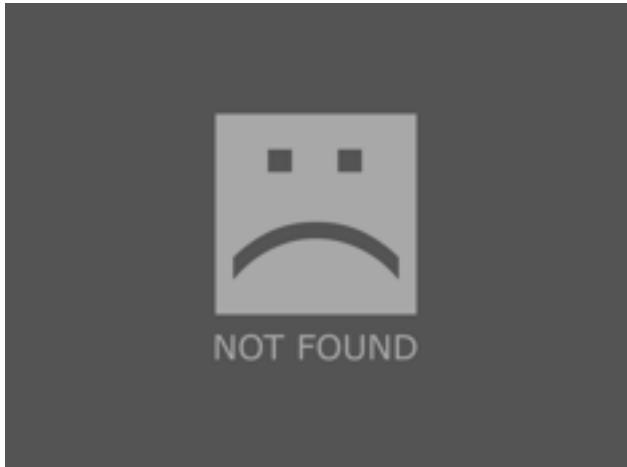
SIGBUS

In computing, a bus error is a fault raised by hardware, notifying an operating system (OS) that a process is trying to access memory that the CPU cannot physically address: an invalid address for the address bus, hence the name. In modern use on most architectures these are much rarer than segmentation faults, which occur primarily due to memory access violations: problems in the logical address or permissions.



SIGSEGV

In computing, a segmentation fault (often shortened to segfault) or access violation is a fault, or failure condition, raised by hardware with memory protection, notifying an operating system (OS) the software has attempted to access a restricted area of memory (a memory access violation). On standard x86 computers, this is a form of general protection fault. The operating system kernel will, in response, usually perform some corrective action, generally passing the fault on to the offending process by sending the process a signal. Processes can in some cases install a custom signal handler, allowing them to recover on their own, but otherwise the OS default signal handler is used, generally causing abnormal termination of the process (a program crash), and sometimes a core dump.



SPARC

SPARC (Scalable Processor Architecture) is a reduced instruction set computer (RISC) instruction set architecture originally developed by Sun Microsystems. Its design was strongly influenced by the experimental Berkeley RISC system developed in the early 1980s. First developed in 1986 and released in 1987, SPARC was one of the most successful early commercial RISC systems, and its success led to the introduction of similar RISC designs from many vendors through the 1980s and 1990s.



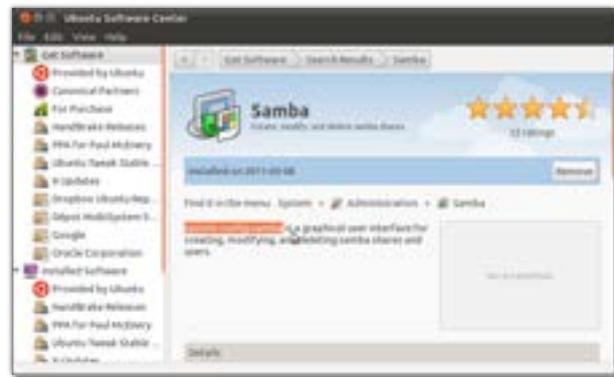
Sabre (computer system)

Sabre Global Distribution System, owned by Sabre Corporation, is a travel reservation system used by travel agents and companies to search, price, book, and ticket travel services provided by airlines, hotels, car rental companies, rail providers and tour



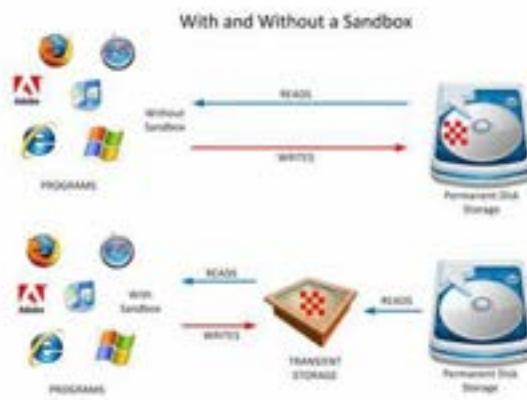
Samba (software)

Samba is a free software re-implementation of the SMB networking protocol, and was originally developed by Andrew Tridgell. Samba provides file and print services for various Microsoft Windows clients and can integrate with a Microsoft Windows Server domain, either as a Domain Controller (DC) or as a domain member. As of version 4, it supports Active Directory and Microsoft Windows NT domains.



Sandbox (computer security)

In computer security, a sandbox is a security mechanism for separating running programs, usually in an effort to mitigate system failures and/or software vulnerabilities from spreading. The isolation metaphor is taken from the idea of children who do not play well together, so each is given their own sandbox to play in alone. It is often used to execute untested or untrusted programs or code, possibly from unverified or untrusted third parties, suppliers, users or websites, without risking harm to the host machine or operating system. A sandbox typically provides a tightly controlled set of resources for guest programs to run in, such as storage and memory scratch space. Network access, the ability to inspect the host system, or read from input devices are usually disallowed or heavily restricted.



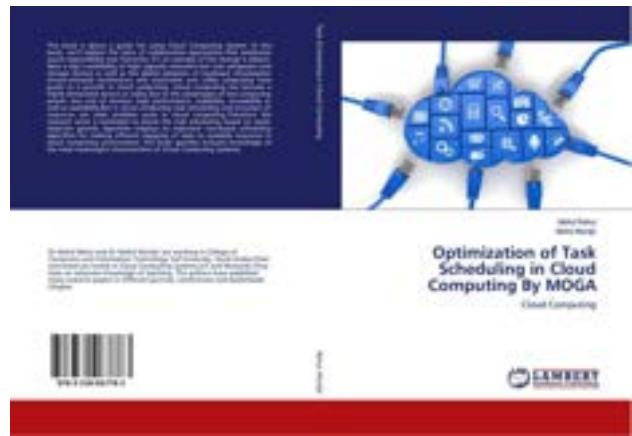
Scheduler (computing)

In computing, scheduling is the action of assigning resources to perform tasks. The resources may be processors, network links or expansion cards. The tasks may be threads, processes or data flows.



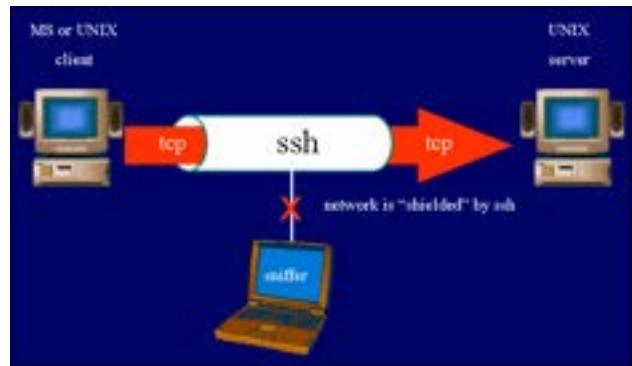
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Secure Shell

The Secure Shell Protocol (SSH) is a cryptographic network protocol for operating network services securely over an unsecured network. Its most notable applications are remote login and command-line execution.



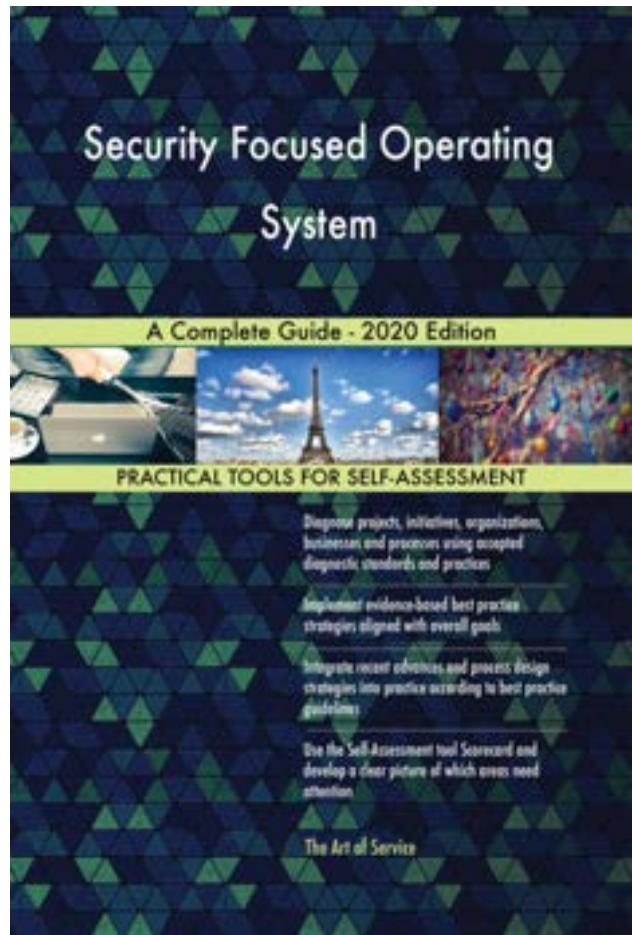
Security service (telecommunication)

Security service is a service, provided by a layer of communicating open systems, which ensures adequate security of the systems or of data transfers as defined by ITU-T X.800 Recommendation.



Security-focused operating system

This is a list of operating systems specifically focused on security. Operating systems for general-purpose usage may be secure without having a specific focus on security. Similar concepts include security-evaluated operating systems that have achieved certification from an auditing organization, and trusted operating systems that provide sufficient support for multilevel security and evidence of correctness to meet a particular set of requirements.

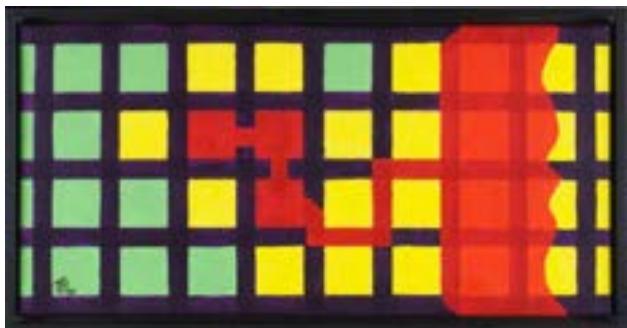


Segmentation fault

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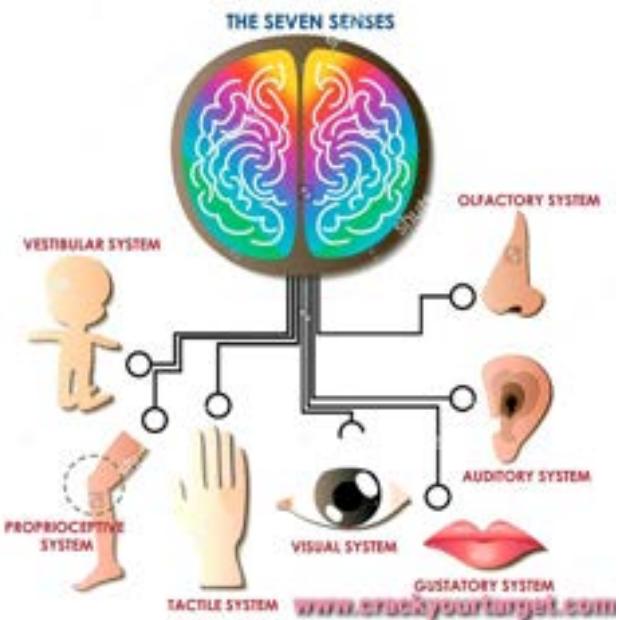
Semantics (computer science)

In programming language theory, semantics is the rigorous mathematical study of the meaning of programming languages. Semantics assigns computational meaning to valid strings in a programming language syntax.



Sensory system

The sensory nervous system is a part of the nervous system responsible for processing sensory information. A sensory system consists of sensory neurons (including the sensory receptor cells), neural pathways, and parts of the brain involved in sensory perception and [interoception]]. Commonly recognized sensory systems are those for vision, hearing, touch, taste, smell, balance and visceral sensation. Sense organs are transducers that convert data from the outer physical world to the realm of the mind where people interpret the information, creating their perception of the world around them. The receptive field is the area of the body or environment to which a receptor organ and receptor cells respond. For instance, the part of the world an eye can see, is its receptive field; the light that each rod or cone can see, is its receptive field. Receptive fields have been identified for the visual system, auditory system and somatosensory system.



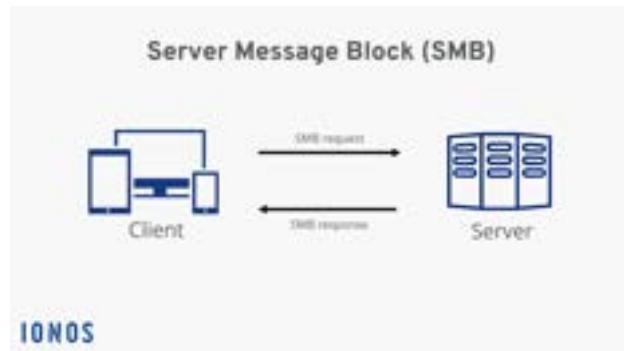
Server (computing)

In computing, a server is a piece of computer hardware or software (computer program) that provides functionality for other programs or devices, called "clients". This architecture is called the client?server model. Servers can provide various functionalities, often called "services", such as sharing data or resources among multiple clients, or performing computation for a client. A single server can serve multiple clients, and a single client can use multiple servers. A client process may run on the same device or may connect over a network to a server on a different device. Typical servers are database servers, file servers, mail servers, print servers, web servers, game servers, and application servers. Client?server systems are usually most frequently implemented by (and often identified with) the request?response model: a client sends a request to the server, which performs some action and sends a response back to the client, typically with a result or acknowledgment. Designating a computer as "server-class hardware" implies that it is specialized for running servers on it. This often implies that it is more powerful and reliable than standard personal computers, but alternatively, large computing clusters may be composed of many relatively simple, replaceable server components.



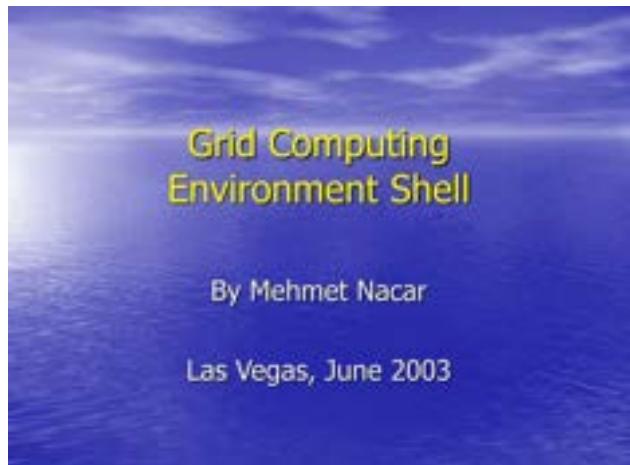
Server message block

Server Message Block (SMB) is a communication protocol originally developed in 1983 by Barry A. Feigenbaum at IBM and intended to provide shared access to files and printers across nodes on a network of systems running IBM's OS/2. It also provides an authenticated inter-process communication (IPC) mechanism. In 1987, Microsoft and 3Com implemented SMB in LAN Manager for OS/2, at which time SMB used the NetBIOS service atop the NetBIOS Frames protocol as its underlying transport. Later, Microsoft implemented SMB in Windows NT 3.1 and has been updating it ever since, adapting it to work with newer underlying transports: TCP/IP and NetBT. SMB implementation consists of two vaguely named Windows services: "Server" (ID: LanmanServer) and "Workstation" (ID: LanmanWorkstation). It uses NTLM or Kerberos protocols for user authentication.



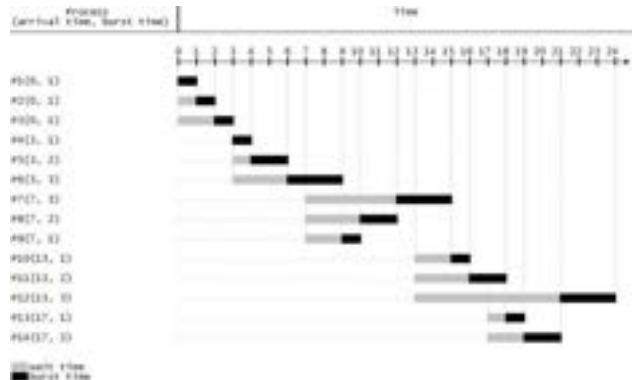
Shell (computing)

In computing, a shell is a computer program that exposes an operating system's services to a human user or other programs. In general, operating system shells use either a command-line interface (CLI) or graphical user interface (GUI), depending on a computer's role and particular operation. It is named a shell because it is the outermost layer around the operating system. Command-line shells require the user to be familiar with commands and their calling syntax, and to understand concepts about the shell-specific scripting language (for example, bash), while graphical shells place a low burden on beginning computer users and are characterized as being easy to use, yet most GUI-enabled operating systems also provide CLI shells, normally for performing advanced tasks.



Shortest job next

Shortest job next (SJN), also known as shortest job first (SJF) or shortest process next (SPN), is a scheduling policy that selects for execution the waiting process with the smallest execution time. SJN is a non-preemptive algorithm. Shortest remaining time is a preemptive variant of SJN.



Signal (IPC)

Signals are standardized messages sent to a running program to trigger specific behavior, such as quitting or error handling. They are a limited form of inter-process communication (IPC), typically used in Unix, Unix-like, and other POSIX-compliant operating systems.



Single address space operating system

In computer science, a single address space operating system (or SASOS) is an operating system that provides only one globally shared address space for all processes. In a single address space operating system, numerically identical (virtual memory) logical addresses in different processes all refer to exactly the same byte of data. Single address-space operating systems offer certain advantages. In a traditional OS with private per-process address space, memory protection is based on address space boundaries ("address space isolation"). Single address-space operating systems use a different approach for memory protection that is just as strong. One advantage is that the same virtual-to-physical map page table can be used with every process (and in some SASOS, the kernel as well). This makes context switches on a SASOS faster than on operating systems that must change the page table and flush the TLB caches on every context switch.



Single-board computer

A single-board computer (SBC) is a complete computer built on a single circuit board, with microprocessor(s), memory, input/output (I/O) and other features required of a functional computer. Single-board computers are commonly made as demonstration or development systems, for educational systems, or for use as embedded computer controllers. Many types of home computers or portable computers integrate all their functions onto a single printed circuit board.



Singularity (operating system)

Singularity is an experimental operating system developed by Microsoft Research between July 9, 2003, and February 7, 2015. It was designed as a high dependability OS in which the kernel, device drivers, and application software were all written in managed code. Internal security uses type safety instead of hardware memory protection.



Smartphone

A smartphone is a portable computer device that combines mobile telephone functions and computing functions into one unit. They are distinguished from older-design feature phones by their stronger hardware capabilities and extensive mobile operating systems, which facilitate wider software, access to the internet (including web browsing over mobile broadband), and multimedia functionality (including music, video, cameras, and gaming), alongside core phone functions such as voice calls and text messaging. Smartphones typically contain a number of metal?oxide?

semiconductor (MOS) integrated circuit (IC) chips, include various sensors that can be leveraged by pre-installed and third-party software (such as a magnetometer, a proximity sensor, a barometer, a gyroscope, an accelerometer, and more), and support wireless communication protocols (such as Bluetooth, Wi-Fi, or satellite navigation). More recently, smartphone manufacturers have begun to integrate satellite messaging connectivity and satellite emergency services into devices for use in remote regions where there is no reliable cellular network.



Smartwatch

A smartwatch is a wearable computer in the form of a watch; modern smartwatches provide a local touchscreen interface for daily use, while an associated smartphone app provides management and telemetry, such as long-term biomonitoring. While early models could perform basic tasks, such as calculations, digital time telling, translations, and game-playing, smartwatches released since 2015 have more general functionality closer to smartphones, including mobile apps, a mobile operating system and WiFi/Bluetooth connectivity. Some smartwatches function as portable media players, with FM radio and playback of digital audio and video files via a Bluetooth headset. Some models, called watch phones (or phone watches), have mobile cellular functionality such as making telephone calls. While internal hardware varies, most have an electronic visual display, either backlit LCD or OLED. Some use transreflective or electronic paper, to consume less power. They are usually powered by a rechargeable lithium-ion battery. Peripheral devices may include digital cameras, thermometers, accelerometers, pedometers, heart rate monitors, altimeters, barometers, compasses, GPS receivers, tiny speakers, and microSD cards, which are recognized as storage devices by many other kinds of computers.



Social computing

Social computing is an area of computer science that is concerned with the intersection of social behavior and computational systems. It is based on creating or recreating social conventions and social contexts through the use of software and technology. Thus, blogs, email, instant messaging, social network services, wikis, social bookmarking and other instances of what is often called social software illustrate ideas from social computing.



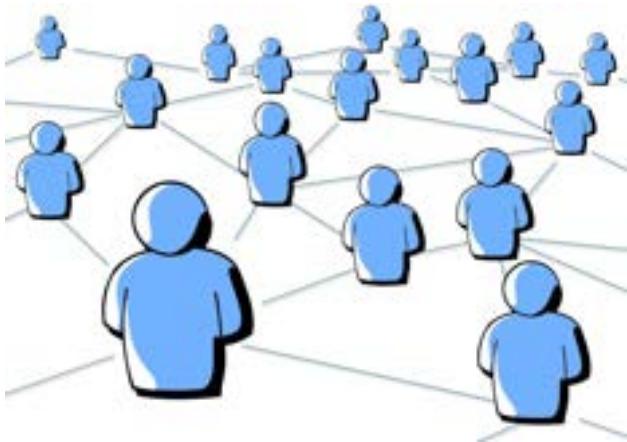
Social software

Social software, also known as social apps or social platform, include communications and interactive tools that are often based on the Internet. Communication tools typically handle the capturing, storing and presentation of communication, usually written but increasingly including audio and video as well. Interactive tools handle mediated interactions between a pair or group of users. They focus on establishing and maintaining a connection among users, facilitating the mechanics of conversation and talk. Social software generally refers to software that makes collaborative behaviour, the organisation and moulding of communities, self-expression, social interaction and feedback possible for individuals. Another element of the existing definition of social software is that it allows for the structured mediation of opinion between people, in a centralized or self-regulating manner. The most improved area for social software is that Web 2.0 applications can all promote cooperation between people and the creation of online communities more than ever before. The opportunities offered by social software are instant connection and the opportunity to learn. An additional defining feature of social software is that apart from interaction and collaboration, it aggregates the collective behaviour of its users, allowing not only crowds to learn from an individual but individuals to learn from the crowds as well. Hence, the interactions enabled by social software can be one-on-one, one-to-many, or many-to-many.



Social system

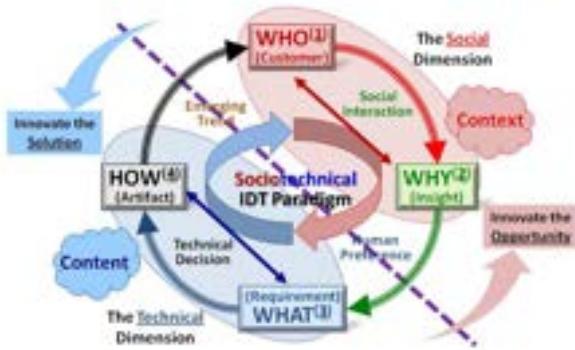
In sociology, a social system is the patterned network of relationships constituting a coherent whole that exist between individuals, groups, and institutions. It is the formal structure of role and status that can form in a small, stable group. An individual may belong to multiple social systems at once; examples of social systems include nuclear family units, communities, cities, nations, college campuses, corporations, and industries. The organization and definition of groups within a social system depend on various shared properties such as location, socioeconomic status, race, religion, societal function, or other distinguishable features.



Sociotechnical system

Sociotechnical systems (STS) in organizational development is an approach to complex organizational work design that recognizes the interaction between people and technology in workplaces. The term also refers to coherent systems of human relations, technical objects, and cybernetic processes that inhere to large, complex infrastructures. Social society, and its constituent substructures, qualify as complex sociotechnical systems. The term sociotechnical systems was coined by Eric Trist, Ken Bamforth and Fred Emery, in the World War II era, based on their work with workers in English coal mines at the Tavistock Institute in London. Sociotechnical systems pertain to theory regarding the social aspects of people and society and technical aspects of organizational structure and processes. Here, technical does not necessarily imply material technology. The focus is on procedures and related knowledge, i.e. it refers to the ancient Greek term techne. "Technical" is a term used to refer to structure and a broader sense of technicalities. Sociotechnical refers to the interrelatedness of social and technical aspects of an organization or the society as a whole. Sociotechnical theory is about joint optimization, with a shared emphasis on achievement of both excellence in technical performance and quality in people's work lives. Sociotechnical theory, as distinct from sociotechnical systems, proposes a number of different ways of achieving joint optimisation. They are usually based on designing different kinds of organisation, according to which the functional output of different sociotechnical elements leads to system efficiency, productive sustainability, user satisfaction, and change management.

The sociotechnical IDT paradigm



Software

Software is a set of computer programs and associated documentation and data. This is in contrast to hardware, from which the system is built and which actually performs the work.



Software architecture

Software architecture is the set of structures needed to reason about a software system and the discipline of creating such structures and systems. Each structure comprises software elements, relations among them, and properties of both elements and relations. The architecture of a software system is a metaphor, analogous to the architecture of a building. It functions as the blueprints for the system and the development project, which project management can later use to extrapolate the tasks necessary to be executed by the teams and people involved.



Software configuration management

In software engineering, software configuration management (SCM or S/W CM) is the task of tracking and controlling changes in the software, part of the larger cross-disciplinary field of configuration management. SCM practices include revision control and the establishment of baselines. If something goes wrong, SCM can determine the "what, when, why and who" of the change. If a configuration is working well, SCM can determine how to replicate it across many hosts.



Software construction

Software construction is a software engineering discipline. It is the detailed creation of working meaningful software through a combination of coding, verification, unit testing, integration testing, and debugging. It is linked to all the other software engineering disciplines, most strongly to software design and software testing.



Software deployment

Software deployment is all of the activities that make a software system available for use. The general deployment process consists of several interrelated activities with possible transitions between them. These activities can occur on the producer side or on the consumer side or both. Because every software system is unique, the precise processes or procedures within each activity can hardly be defined. Therefore, "deployment" should be interpreted as a general process that has to be customized according to specific requirements or characteristics.



Software design

Software design is the process by which an agent creates a specification of a software artifact intended to accomplish goals, using a set of primitive components and subject to constraints. Software design may refer to either "all the activity involved in conceptualizing, framing, implementing, commissioning, and ultimately modifying complex systems" or "the activity following requirements specification and before programming, as ... [in] a stylized software engineering process." Software design usually involves problem-solving and planning a software solution. This includes both a low-level component and algorithm design and a high-level, architecture design.



Software development

Software development is the process of conceiving, specifying, designing, programming, documenting, testing, and bug fixing involved in creating and maintaining applications, frameworks, or other software components. Software development involves writing and maintaining the source code, but in a broader sense, it includes all processes from the conception of the desired software through to the final manifestation of the software, typically in a planned and structured process. Software development also includes research, new development, prototyping, modification, reuse, re-engineering, maintenance, or any other activities that result in software products.



Software development process

In software engineering, a software development process is a process of dividing software development work into smaller, parallel, or sequential steps or subprocesses to improve design and/or product management. It is also known as a software development life cycle (SDLC). The methodology may include the pre-definition of specific deliverables and artifacts that are created and completed by a project team to develop or maintain an application. Most modern development processes can be vaguely described as agile. Other methodologies include waterfall, prototyping, iterative and incremental development, spiral development, rapid application development, and extreme programming.



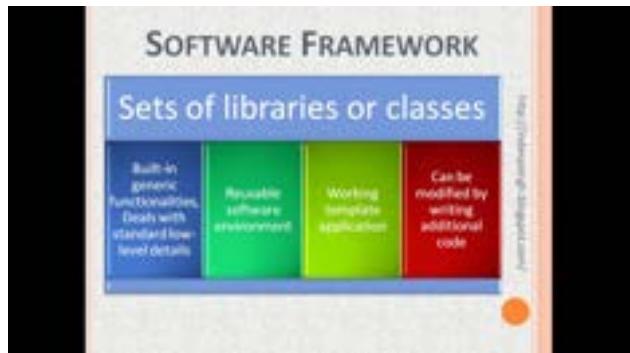
Software engineering

Software engineering is a systematic engineering approach to software development. A software engineer is a person who applies the principles of software engineering to design, develop, maintain, test, and evaluate computer software. The term programmer is sometimes used as a synonym, but may also lack connotations of engineering education or skills.



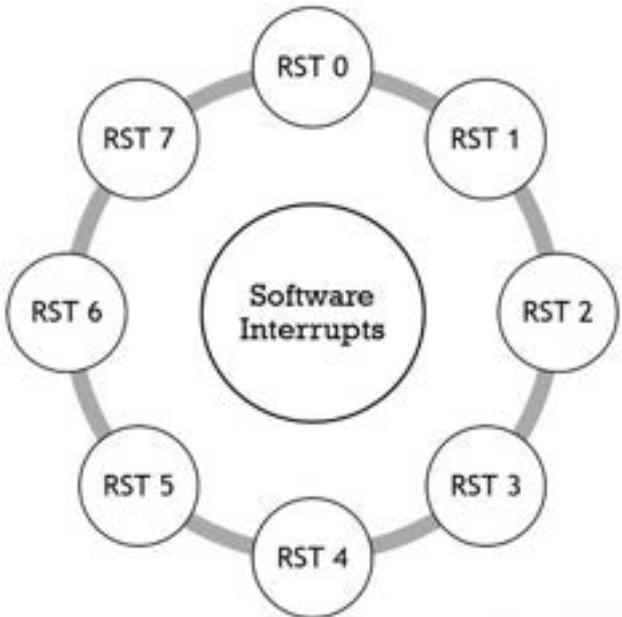
Software framework

In computer programming, a software framework is an abstraction in which software, providing generic functionality, can be selectively changed by additional user-written code, thus providing application-specific software. It provides a standard way to build and deploy applications and is a universal, reusable software environment that provides particular functionality as part of a larger software platform to facilitate the development of software applications, products and solutions.



Software interrupt

In digital computers, an interrupt (sometimes referred to as a trap) is a request for the processor to interrupt currently executing code (when permitted), so that the event can be processed in a timely manner. If the request is accepted, the processor will suspend its current activities, save its state, and execute a function called an interrupt handler (or an interrupt service routine, ISR) to deal with the event. This interruption is often temporary, allowing the software to resume normal activities after the interrupt handler finishes, although the interrupt could instead indicate a fatal error. Interrupts are commonly used by hardware devices to indicate electronic or physical state changes that require time-sensitive attention. Interrupts are also commonly used to implement computer multitasking, especially in real-time computing. Systems that use interrupts in these ways are said to be interrupt-driven.



Software maintenance

Software maintenance in software engineering is the modification of a software product after delivery to correct faults, to improve performance or other attributes. A common perception of maintenance is that it merely involves fixing defects. However, one study indicated that over 80% of maintenance effort is used for non-corRECTive actions. This perception is perpetuated by users submitting problem reports that in reality are functionality enhancements to the system. More recent studies put the bug-fixing proportion closer to 21%.



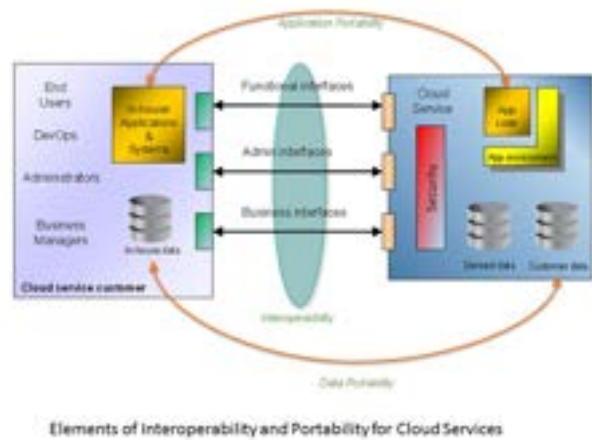
Software platform

A computing platform or digital platform is an environment in which a piece of software is executed. It may be the hardware or the operating system (OS), even a web browser and associated application programming interfaces, or other underlying software, as long as the program code is executed with it. Computing platforms have different abstraction levels, including a computer architecture, an OS, or runtime libraries. A computing platform is the stage on which computer programs can run.



Software portability

A computer program is said to be portable if there is very low effort required to make it run on different platforms. The pre-requisite for portability is the generalized abstraction between the application logic and system interfaces. When software with the same functionality is produced for several computing platforms, portability is the key issue for development cost reduction.



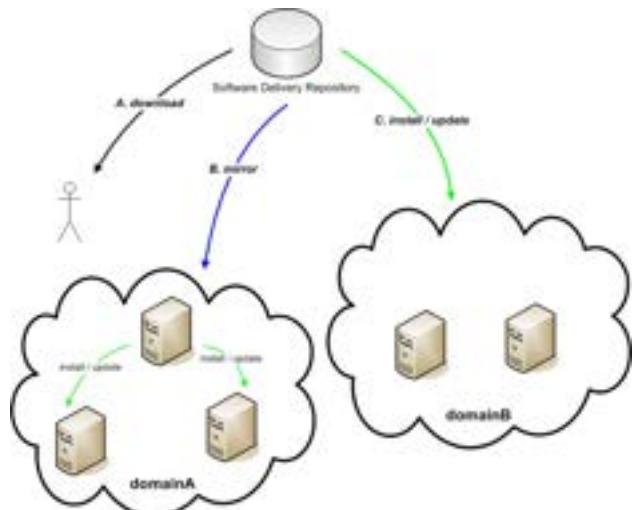
Software quality

In the context of software engineering, software quality refers to two related but distinct notions:



Software repository

A software repository, or repo for short, is a storage location for software packages. Often a table of contents is also stored, along with metadata. A software repository is typically managed by source or version control, or repository managers. Package managers allow automatically installing and updating repositories, sometimes called "packages".



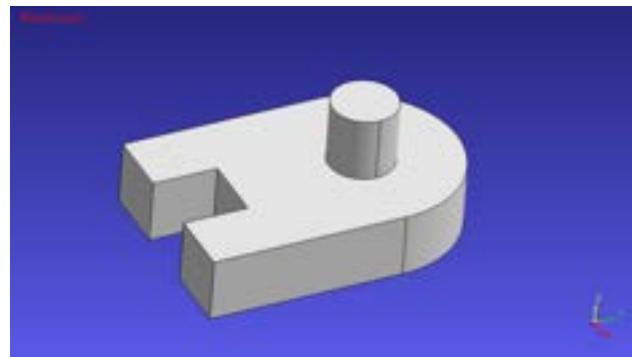
Solaris (operating system)

Solaris is a proprietary Unix operating system originally developed by Sun Microsystems. After the Sun acquisition by Oracle in 2010, it was renamed Oracle Solaris. Solaris superseded the company's earlier SunOS in 1993, and became known for its scalability, especially on SPARC systems, and for originating many innovative features such as DTrace, ZFS and Time Slider.



Solid modeling

Solid modeling (or solid modelling) is a consistent set of principles for mathematical and computer modeling of three-dimensional shapes (solids). Solid modeling is distinguished from related areas of geometric modeling and computer graphics, such as 3D modeling, by its emphasis on physical fidelity. Together, the principles of geometric and solid modeling form the foundation of 3D-computer-aided design and in general support the creation, exchange, visualization, animation, interrogation, and annotation of digital models of physical objects.



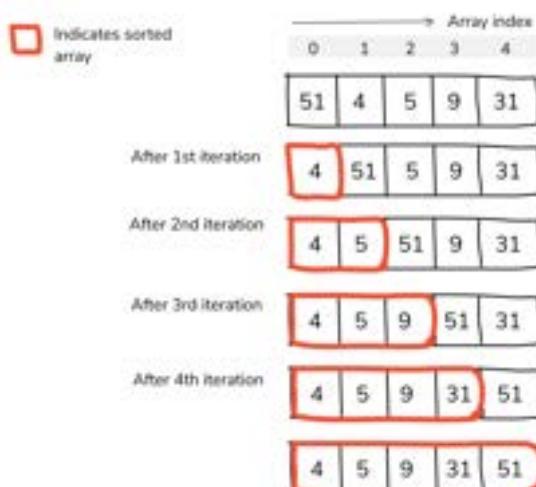
Solid state drives

A solid-state drive (SSD) is a solid-state storage device that uses integrated circuit assemblies to store data persistently, typically using flash memory, and functioning as secondary storage in the hierarchy of computer storage. It is also sometimes called a semiconductor storage device, a solid-state device or a solid-state disk, even though SSDs lack the physical spinning disks and movable read/write heads used in hard disk drives (HDDs) and floppy disks. SSD also has rich internal parallelism for data processing. In comparison to hard disk drives and similar electromechanical media which use moving parts, SSDs are typically more resistant to physical shock, run silently, and have higher input/output rates and lower latency. SSDs store data in semiconductor cells. As of 2019, cells can contain between 1 and 4 bits of data. SSD storage devices vary in their properties according to the number of bits stored in each cell, with single-bit cells ("Single Level Cells" or "SLC") being generally the most reliable, durable, fast, and expensive type, compared with 2- and 3-bit cells ("Multi-Level Cells/MLC" and "Triple-Level Cells/TLC"), and finally quad-bit cells ("QLC") being used for consumer devices that do not require such extreme properties and are the cheapest per gigabyte (GB) of the four. In addition, 3D XPoint memory (sold by Intel under the Optane brand) stores data by changing the electrical resistance of cells instead of storing electrical charges in cells, and SSDs made from RAM can be used for high speed, when data persistence after power loss is not required, or may use battery power to retain data when its usual power source is unavailable.



Sorting algorithm

In computer science, a sorting algorithm is an algorithm that puts elements of a list into an order. The most frequently used orders are numerical order and lexicographical order, and either ascending or descending. Efficient sorting is important for optimizing the efficiency of other algorithms (such as search and merge algorithms) that require input data to be in sorted lists. Sorting is also often useful for canonicalizing data and for producing human-readable output.



Sperry Rand

Sperry Corporation was a major American equipment and electronics company whose existence spanned more than seven decades of the 20th century. Sperry ceased to exist in 1986 following a prolonged hostile takeover bid engineered by Burroughs Corporation, which merged the combined operation under the new name Unisys. Some of Sperry's former divisions became part of Honeywell, Lockheed Martin, Raytheon Technologies, and Northrop Grumman.



Spooling

In computing, spooling is a specialized form of multi-programming for the purpose of copying data between different devices. In contemporary systems, it is usually used for mediating between a computer application and a slow peripheral, such as a printer. Spooling allows programs to "hand off" work to be done by the peripheral and then proceed to other tasks, or to not begin until input has been transcribed. A dedicated program, the spooler, maintains an orderly sequence of jobs for the peripheral and feeds it data at its own rate. Conversely, for slow input peripherals, such as a card reader, a spooler can maintain a sequence of computational jobs waiting for data, starting each job when all of the relevant input is available; see batch processing. The spool itself refers to the sequence of jobs, or the storage area where they are held. In many cases, the spooler is able to drive devices at their full rated speed with minimal impact on other processing.



Stack machine

In computer science, computer engineering and programming language implementations, a stack machine is a computer processor or a virtual machine in which the primary interaction is moving short-lived temporary values to and from a push down stack. In the case of a hardware processor, a hardware stack is used. The use of a stack significantly reduces the required number of processor registers. Stack machines extend push-down automata with additional load/store operations or multiple stacks and hence are Turing-complete.



Star system

A star system or stellar system is a small number of stars that orbit each other, bound by gravitational attraction. A large group of stars bound by gravitation is generally called a star cluster or galaxy, although, broadly speaking, they are also star systems. Star systems are not to be confused with planetary systems, which include planets and similar bodies (such as comets).

Statistics

Statistics (from German: Statistik, orig. "description of a state, a country") is the discipline that concerns the collection, organization, analysis, interpretation, and presentation of data. In applying statistics to a scientific, industrial, or social problem, it is conventional to begin with a statistical population or a statistical model to be studied. Populations can be diverse groups of people or objects such as "all people living in a country" or "every atom composing a crystal". Statistics deals with every aspect of data, including the planning of data collection in terms of the design of surveys and experiments. When census data cannot be collected, statisticians collect data by developing specific experiment designs and survey samples.

Representative sampling assures that inferences and conclusions can reasonably extend from the sample to the population as a whole. An experimental study involves taking measurements of the system under study, manipulating the system, and then taking additional measurements using the same procedure to determine if the manipulation has modified the values of the measurements. In contrast, an observational study does not involve experimental manipulation.



Status message

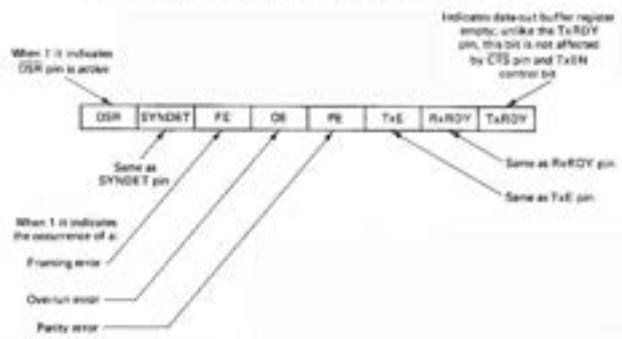
A status message is a function of some instant messaging applications whereby a user may post a message that appears automatically to other users if they attempt to make contact. A status message can tell other contacts the user's current status, such as being busy or what the user is currently doing. It is analogous to the voice message in an answering machine or voice mail system. However, status messages may be displayed even if the person is present. They are often updated much more frequently than messages in answering machines, and thus may serve as a means of instant, limited "publication" or indirect communication.

"We should all start to live before we get too old. Fear is stupid. So are regrets."

Status register

A status register, flag register, or condition code register (CCR) is a collection of status flag bits for a processor. Examples of such registers include FLAGS register in the x86 architecture, flags in the program status word (PSW) register in the IBM System/360 architecture through z/Architecture, and the application program status register (APSR) in the ARM Cortex-A architecture. The status register is a hardware register that contains information about the state of the processor. Individual bits are implicitly or explicitly read and/or written by the machine code instructions executing on the processor. The status register lets an instruction take action contingent on the outcome of a previous instruction.

Format of the status register



Stephanie Forrest

Stephanie Forrest (born circa 1958) is an American computer scientist and director of the Biodesign Center for Biocomputing, Security and Society at the Biodesign Institute at Arizona State University. She was previously Distinguished Professor of Computer Science at the University of New Mexico in Albuquerque. She is best known for her work in adaptive systems, including genetic algorithms, computational immunology, biological modeling, automated software repair, and computer security.



Steve Jobs

Steven Paul Jobs (February 24, 1955 – October 5, 2011) was an American entrepreneur, business magnate, industrial designer, media proprietor, and investor. He was the co-founder, chairman, and CEO of Apple; the chairman and majority shareholder of Pixar; a member of The Walt Disney Company's board of directors following its acquisition of Pixar; and the founder, chairman, and CEO of NeXT. He is widely recognized as a pioneer of the personal computer revolution of the 1970s and 1980s, along with his early business partner and fellow Apple co-founder Steve Wozniak.



Sun Microsystems

Sun Microsystems, Inc. (Sun for short) was an American technology company that sold computers, computer components, software, and information technology services and created the Java programming language, the Solaris operating system, ZFS, the Network File System (NFS), and SPARC microprocessors. Sun contributed significantly to the evolution of several key computing technologies, among them Unix, RISC processors, thin client computing, and virtualized computing. Notable Sun acquisitions include Cray Business Systems Division, Storagetek, and Innotek GmbH, creators of VirtualBox. Sun was founded on February 24, 1982. At its height, the Sun headquarters were in Santa Clara, California (part of Silicon Valley), on the former west campus of the Agnews Developmental Center.



Supercomputer

A supercomputer is a computer with a high level of performance as compared to a general-purpose computer. The performance of a supercomputer is commonly measured in floating-point operations per second (FLOPS) instead of million instructions per second (MIPS). Since 2017, there have existed supercomputers which can perform over 10^{17} FLOPS (a hundred quadrillion FLOPS, 100 petaFLOPS or 100 PFLOPS). For comparison, a desktop computer has performance in the range of hundreds of gigaFLOPS (10^{11}) to tens of teraFLOPS (10^{13}). Since November 2017, all of the world's fastest 500 supercomputers run on Linux-based operating systems. Additional research is being conducted in the United States, the European Union, Taiwan, Japan, and China to build faster, more powerful and technologically superior exascale supercomputers. Supercomputers play an important role in the field of computational science, and are used for a wide range of computationally intensive tasks in various fields, including quantum mechanics, weather forecasting, climate research, oil and gas exploration, molecular modeling (computing the structures and properties of chemical compounds, biological macromolecules, polymers, and crystals), and physical simulations (such as simulations of the early moments of the universe, airplane and spacecraft aerodynamics, the detonation of nuclear weapons, and nuclear fusion). They have been essential in the field of cryptanalysis. Supercomputers were introduced in the 1960s, and for several decades the fastest were made by Seymour Cray at Control Data Corporation (CDC), Cray Research and subsequent companies bearing his name or monogram. The first such machines were highly tuned conventional designs that ran more quickly than their more general-purpose contemporaries.

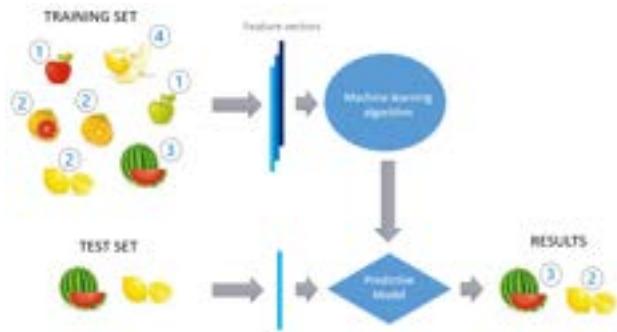


Supercomputer operating system

A supercomputer operating system is an operating system intended for supercomputers. Since the end of the 20th century, supercomputer operating systems have undergone major transformations, as fundamental changes have occurred in supercomputer architecture. While early operating systems were custom tailored to each supercomputer to gain speed, the trend has been moving away from in-house operating systems and toward some form of Linux, with it running all the supercomputers on the TOP500 list in November 2017. In 2021, top 10 computers run for instance Red Hat Enterprise Linux (RHEL), or some variant of it or other Linux distribution e.g. Ubuntu.

Supervised learning

Supervised learning (SL) is a machine learning paradigm for problems where the available data consists of labeled examples, meaning that each data point contains features (covariates) and an associated label. The goal of supervised learning algorithms is learning a function that maps feature vectors (inputs) to labels (output), based on example input-output pairs. It infers a function from labeled training data consisting of a set of training examples. In supervised learning, each example is a pair consisting of an input object (typically a vector) and a desired output value (also called the supervisory signal). A supervised learning algorithm analyzes the training data and produces an inferred function, which can be used for mapping new examples. An optimal scenario will allow for the algorithm to correctly determine the class labels for unseen instances. This requires the learning algorithm to generalize from the training data to unseen situations in a "reasonable" way (see inductive bias). This statistical quality of an algorithm is measured through the so-called generalization error.



Supervisor mode

In computer science, hierarchical protection domains, often called protection rings, are mechanisms to protect data and functionality from faults (by improving fault tolerance) and malicious behavior (by providing computer security).



Syllable Desktop

Syllable Desktop is a discontinued free and open-source operating system for Pentium and compatible processors. Its purpose is to create an easy-to-use desktop operating system for the home and small office user. It was forked from the stagnant AtheOS in July 2002.



Symbian

Symbian is a discontinued mobile operating system (OS) and computing platform designed for smartphones. It was originally developed as a proprietary software OS for personal digital assistants in 1998 by the Symbian Ltd. consortium. Symbian OS is a descendant of Psion's EPOC, and was released exclusively on ARM processors, although an unreleased x86 port existed. Symbian was used by many major mobile phone brands, like Samsung, Motorola, Sony Ericsson, and above all by Nokia. It was also prevalent in Japan by brands including Fujitsu, Sharp and Mitsubishi. As a pioneer that established the smartphone industry, it was the most popular smartphone OS on a worldwide average until the end of 2010, at a time when smartphones were in limited use, when it was overtaken by iOS and Android. It was notably less popular in North America.



Synthography

Synthography is the method of generating digital media synthetically using machine learning. This is distinct from other graphic creation and editing methods in that synthography uses artificial intelligence art text-to-image models to generate synthetic media. It is commonly achieved by prompt engineering text descriptions as input to create or edit a desired image. Text-to-image models, algorithms, and software are tools used in synthography that are designed to have technical proficiency in creating the resulting artificial intelligence art output based on human input. Synthography typically uses text-to-image models to synthesize new images as a derivative of the training, validation, and test data sets on which the text-to-image models were trained. Another technique is to fine-tune an already trained model on an image dataset to teach it a specific concept.



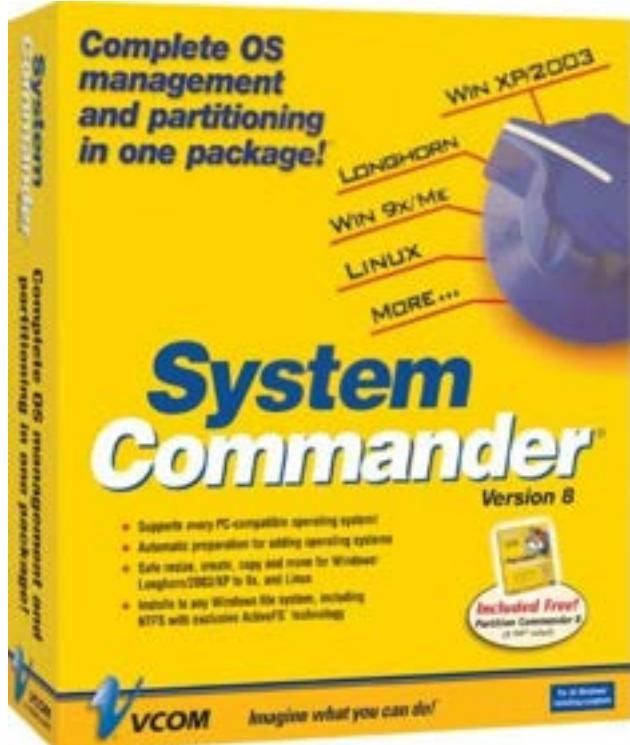
System

A system is a group of interacting or interrelated elements that act according to a set of rules to form a unified whole. A system, surrounded and influenced by its environment, is described by its boundaries, structure and purpose and expressed in its functioning. Systems are the subjects of study of systems theory and other systems sciences.



System Commander

System Commander (SC for short) is a graphical boot manager/loader software application developed by VCOM. The software allowed for multiple operating systems to be installed onto a machine at once, providing a menu from which the user selected the operating system they wished to boot from. Other software with similar functionality includes NTLDR, LILO, GRUB, and Graphical Boot Manager. One of its components was named Partition Commander.



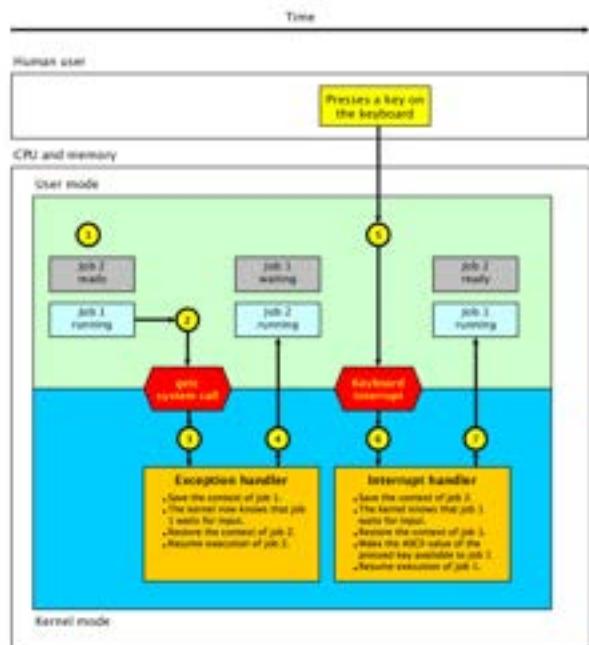
System V

Unix System V (pronounced: "System Five") is one of the first commercial versions of the Unix operating system. It was originally developed by AT&T and first released in 1983. Four major versions of System V were released, numbered 1, 2, 3, and 4. System V Release 4 (SVR4) was commercially the most successful version, being the result of an effort, marketed as Unix System Unification, which solicited the collaboration of the major Unix vendors. It was the source of several common commercial Unix features. System V is sometimes abbreviated to SysV.



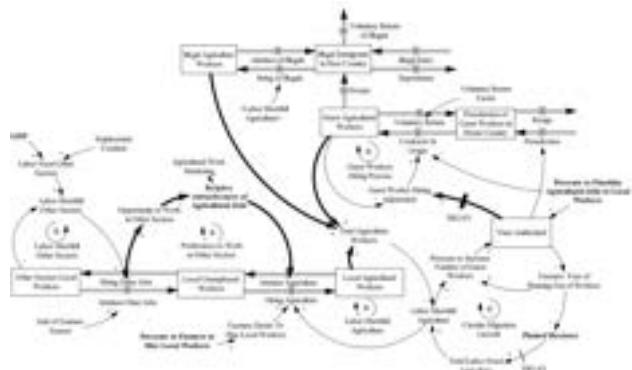
System call

In computing, a system call (commonly abbreviated to `syscall`) is the programmatic way in which a computer program requests a service from the operating system on which it is executed. This may include hardware-related services (for example, accessing a hard disk drive or accessing the device's camera), creation and execution of new processes, and communication with integral kernel services such as process scheduling. System calls provide an essential interface between a process and the operating system.



System dynamics

System dynamics (SD) is an approach to understanding the nonlinear behaviour of complex systems over time using stocks, flows, internal feedback loops, table functions and time delays.



System image

In computing, a system image is a serialized copy of the entire state of a computer system stored in some non-volatile form such as a file. A system is said to be capable of using system images if it can be shut down and later restored to exactly the same state. In such cases, system images can be used for backup.



System library

In computer science, a library is a collection of non-volatile resources used by computer programs, often for software development. These may include configuration data, documentation, help data, message templates, pre-written code and subroutines, classes, values or type specifications. In IBM's OS/360 and its successors they are referred to as partitioned data sets. A library is also a collection of implementations of behavior, written in terms of a language, that has a well-defined interface by which the behavior is invoked. For instance, people who want to write a higher-level program can use a library to make system calls instead of implementing those system calls over and over again. In addition, the behavior is provided for reuse by multiple independent programs. A program invokes the library-provided behavior via a mechanism of the language. For example, in a simple imperative language such as C, the behavior in a library is invoked by using C's normal function-call. What distinguishes the call as being to a library function, versus being to another function in the same program, is the way that the code is organized in the system. Library code is organized in such a way that it can be used by multiple programs that have no connection to each other, while code that is part of a program is organized to be used only within that one program. This distinction can gain a hierarchical notion when a program grows large, such as a multi-million-line program. In that case, there may be internal libraries that are reused by independent sub-portions of the large program.



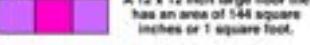
System of measurement

A system of measurement is a collection of units of measurement and rules relating them to each other. Systems of measurement have historically been important, regulated and defined for the purposes of science and commerce. Systems of measurement in use include the International System of Units or SI (the modern form of the metric system), the British imperial system, and the United States customary system.

US measurement system

Length

12 inches = 1 foot	144 square inches = 1 square foot
3 feet = 1 yard	9 square feet = 1 square yard
22 yards = 1 chain	4840 square yards = 1 acre
10 chains = 1 furlong	640 acres = 1 square mile or = 1 section
8 furlongs = 1 mile	
5280 feet = 1 mile	
1760 yards = 1 mile	



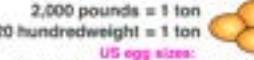
A 12 x 12 inch large floor tile has an area of 144 square inches or 1 square foot.

Area

144 square inches = 1 square foot
9 square feet = 1 square yard
4840 square yards = 1 acre
640 acres = 1 square mile or = 1 section

Weight

16 ounces = 1 pound	1728 cubic inches = 1 cubic foot
14 pounds = 1 stone	27 cubic feet = 1 cubic yard
100 pounds = 1 hundredweight	
2,000 pounds = 1 ton	
20 hundredweight = 1 ton	



US egg sizes:
Small 1.5 oz, Large 2 oz, Jumbo 2.5 oz.

Volume

1728 cubic inches = 1 cubic foot
27 cubic feet = 1 cubic yard

This 1 inch block has a volume of 1 cubic inch, 1 in.
So this cube made from 1,728 blocks has a volume of 1,728 cubic inches, or 1 cubic foot, 1 ft.



98.6°F

Fluid Volume

8 fluid ounces = 1 cup	1 gallon = 4 quarts, 8 pints, 16 cups, 128 fluid ounces
16 fluid ounces = 1 pint	
2 pints = 1 quart	
8 pints or 4 quarts = 1 gallon	

Temperature

The Fahrenheit scale (°F).

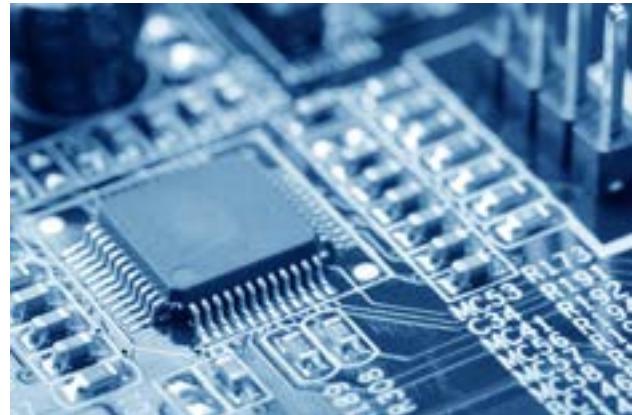


also known as US Standard units, US Standard system, Imperial or English system or just US units

© Study Ladder 2014

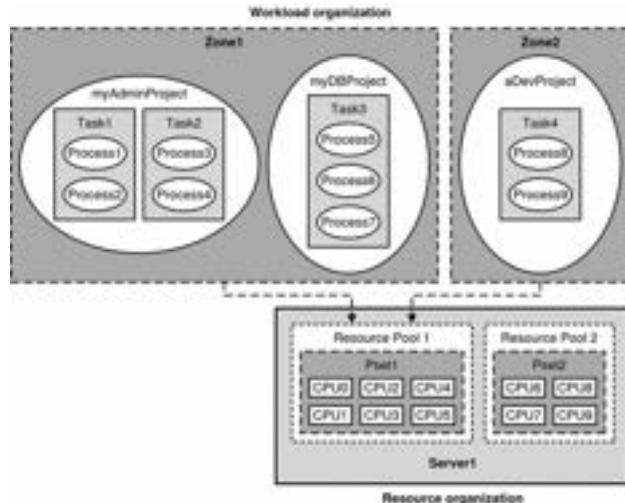
System on a chip

A system on a chip or system-on-chip (SoC ; pl. SoCs) is an integrated circuit that integrates most or all components of a computer or other electronic system. These components almost always include a central processing unit (CPU), memory interfaces, on-chip input/output devices, input/output interfaces, and secondary storage interfaces, often alongside other components such as radio modems and a graphics processing unit (GPU) ? all on a single substrate or microchip. It may contain digital, and also analog, mixed-signal, and often radio frequency signal processing functions (otherwise it may be considered only an application processor).



System resource

In computing, a system resource, or simple resource, is any physical or virtual component of limited availability within a computer system. All connected devices and internal system components are resources. Virtual system resources include files (concretely file handles), network connections (concretely network sockets), and memory areas.



System software

System software is software designed to provide a platform for other software. Examples of system software include operating systems (OS) like macOS, Linux, Android and Microsoft Windows, computational science software, game engines, search engines, industrial automation, and software as a service applications. Application software is software that allows users to do user-oriented tasks such as create text documents, play or develop games, create presentations, listen to music, draw pictures or browse the web. In the late 1940s, the early days of computing, most application software was custom-written by computer users to fit their specific hardware and requirements. System software was usually supplied by the manufacturer of the computer hardware and was intended to be used by most or all users of that system.



Systemics

In the context of systems science and systems philosophy, systemics is an initiative to study systems. It is an attempt at developing logical, mathematical, engineering and philosophical paradigms and frameworks in which physical, technological, biological, social, cognitive and metaphysical systems can be studied and modeled. The term "systemics" was coined in the 1970s by Mario Bunge and others, as an alternative paradigm for research related to general systems theory and systems science.

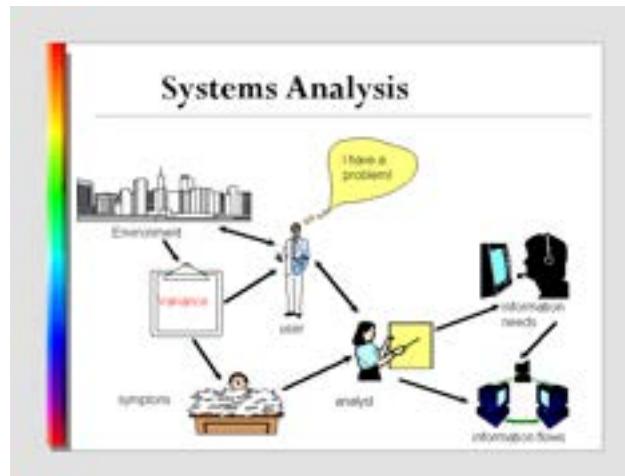


Systems Network Architecture

Systems Network Architecture (SNA) is IBM's proprietary networking architecture, created in 1974. It is a complete protocol stack for interconnecting computers and their resources. SNA describes formats and protocols but, in itself, is not a piece of software. The implementation of SNA takes the form of various communications packages, most notably Virtual Telecommunications Access Method (VTAM), the mainframe software package for SNA communications.

Systems analysis

Systems analysis is "the process of studying a procedure or business to identify its goal and purposes and create systems and procedures that will efficiently achieve them". Another view sees system analysis as a problem-solving technique that breaks down a system into its component pieces, and how well those parts work and interact to accomplish their purpose. The field of system analysis relates closely to requirements analysis or to operations research. It is also "an explicit formal inquiry carried out to help a decision maker identify a better course of action and make a better decision than they might otherwise have made." The terms analysis and synthesis stems from Greek, meaning "to take apart" and "to put together," respectively. These terms are used in many scientific disciplines, from mathematics and logic to economics and psychology, to denote similar investigative procedures. The analysis is defined as "the procedure by which we break down an intellectual or substantial whole into parts," while synthesis means "the procedure by which we combine separate elements or components to form a coherent whole." System analysis researchers apply methodology to the systems involved, forming an overall picture.



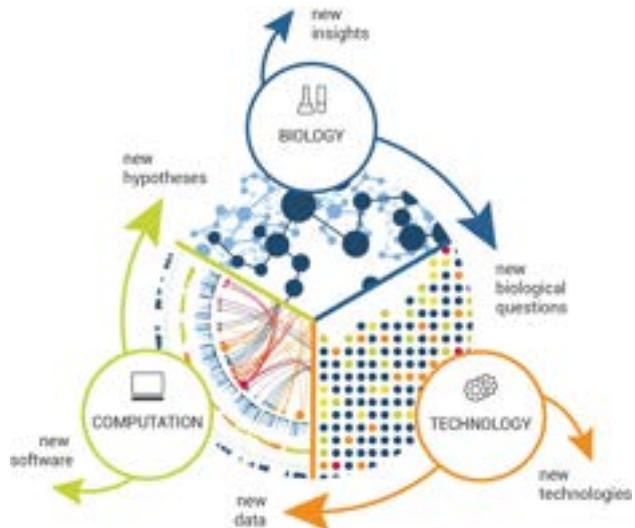
Systems art

Systems art is art influenced by cybernetics, and systems theory, that reflects on natural systems, social systems and social signs of the art world itself. Systems art emerged as part of the first wave of the conceptual art movement extended in the 1960s and 1970s. Closely related and overlapping terms are anti-form movement, cybernetic art, generative systems, process art, systems aesthetic, systemic art, systemic painting, and systems sculptures.



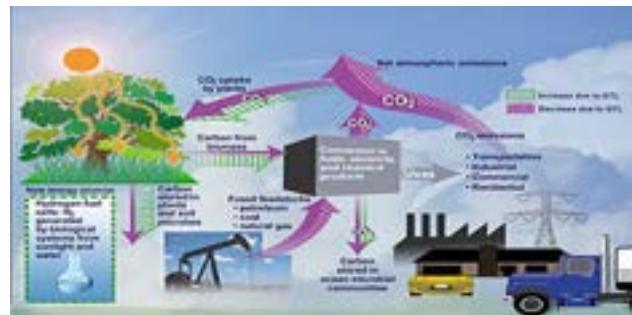
Systems biology

Systems biology is the computational and mathematical analysis and modeling of complex biological systems. It is a biology-based interdisciplinary field of study that focuses on complex interactions within biological systems, using a holistic approach (holism instead of the more traditional reductionism) to biological research. Particularly from the year 2000 onwards, the concept has been used widely in biology in a variety of contexts. The Human Genome Project is an example of applied systems thinking in biology which has led to new, collaborative ways of working on problems in the biological field of genetics. One of the aims of systems biology is to model and discover emergent properties, properties of cells, tissues and organisms functioning as a system whose theoretical description is only possible using techniques of systems biology. These typically involve metabolic networks or cell signaling networks.



Systems ecology

Systems ecology is an interdisciplinary field of ecology, a subset of Earth system science, that takes a holistic approach to the study of ecological systems, especially ecosystems. Systems ecology can be seen as an application of general systems theory to ecology. Central to the systems ecology approach is the idea that an ecosystem is a complex system exhibiting emergent properties. Systems ecology focuses on interactions and transactions within and between biological and ecological systems, and is especially concerned with the way the functioning of ecosystems can be influenced by human interventions. It uses and extends concepts from thermodynamics and develops other macroscopic descriptions of complex systems.



Systems engineering

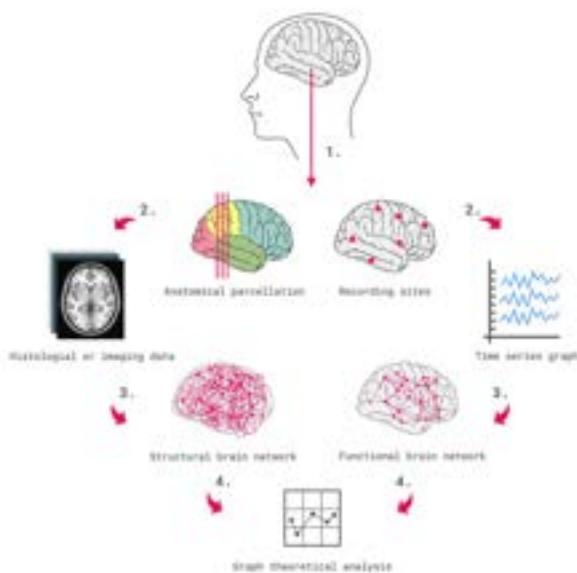
Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function.



Systems neuroscience

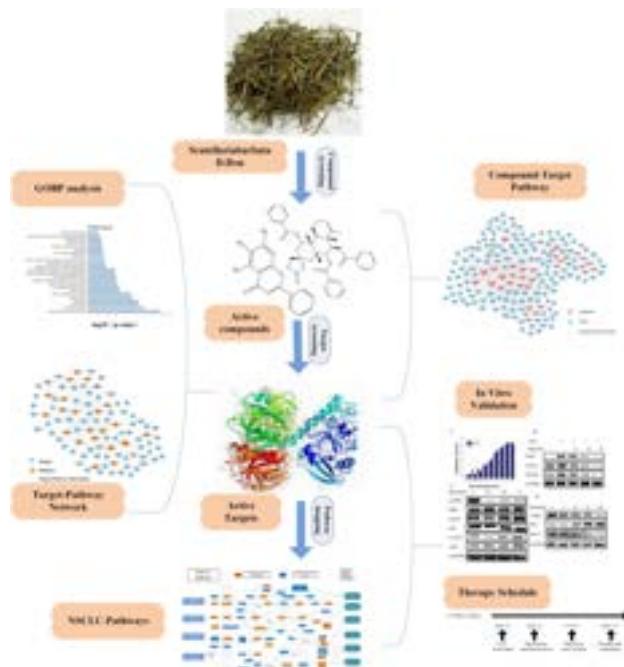
Systems neuroscience is a subdiscipline of neuroscience and systems biology that studies the structure and function of neural circuits and systems. Systems neuroscience encompasses a number of areas of study concerned with how nerve cells behave when connected together to form neural pathways, neural circuits, and larger brain networks. At this level of analysis, neuroscientists study how different neural circuits analyze sensory information, form perceptions of the external world, make decisions, and execute movements.

Researchers in systems neuroscience are concerned with the relation between molecular and cellular approaches to understanding brain structure and function, as well as with the study of high-level mental functions such as language, memory, and self-awareness (which are the purview of behavioral and cognitive neuroscience). Systems neuroscientists typically employ techniques for understanding networks of neurons as they are seen to function, by way of electrophysiology using either single-unit recording or multi-electrode recording, functional magnetic resonance imaging (fMRI), and PET scans. The term is commonly used in an educational framework: a common sequence of graduate school neuroscience courses consists of cellular/molecular neuroscience for the first semester, then systems neuroscience for the second semester. It is also sometimes used to distinguish a subdivision within a neuroscience department in a university.



Systems pharmacology

Systems pharmacology is the application of systems biology principles to the field of pharmacology. It seeks to understand how drugs affect the human body as a single complex biological system.



Systems philosophy

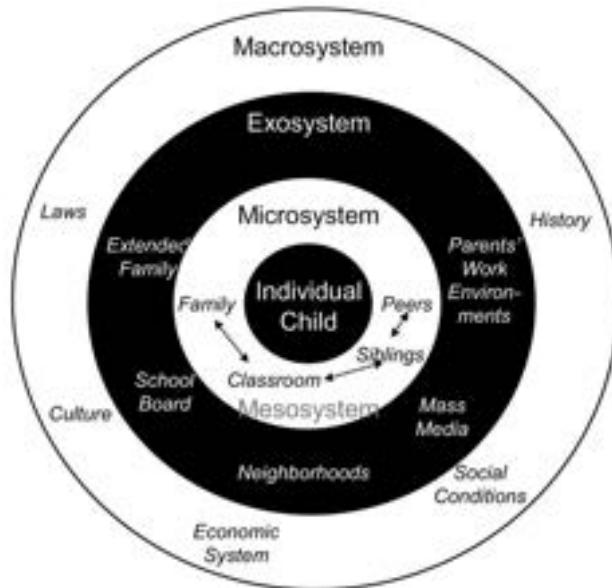
Systems philosophy is a discipline aimed at constructing a new philosophy (in the sense of worldview) by using systems concepts. The discipline was first described by Ervin Laszlo in his 1972 book *Introduction to Systems Philosophy: Toward a New Paradigm of Contemporary Thought*. It has been described as the "reorientation of thought and world view ensuing from the introduction of "systems" as a new scientific paradigm".



We are determined to fulfill
the following three responsibilities.

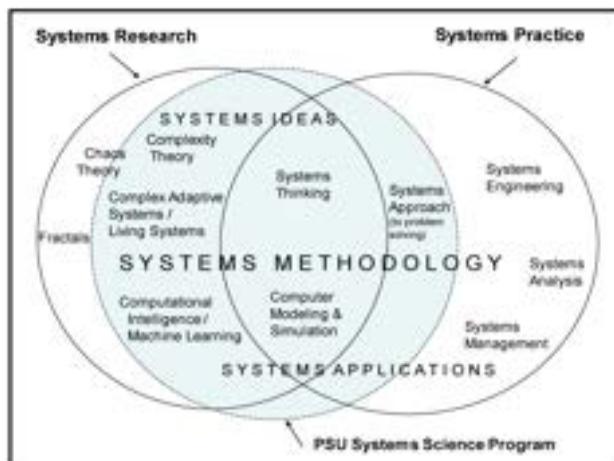
Systems psychology

Systems psychology is a branch of both theoretical psychology and applied psychology that studies human behaviour and experience as complex systems. It is inspired by systems theory and systems thinking, and based on the theoretical work of Roger Barker, Gregory Bateson, Humberto Maturana and others. Groups and individuals are considered as systems in homeostasis. Alternative terms here are "systemic psychology", "systems behavior", and "systems-based psychology".



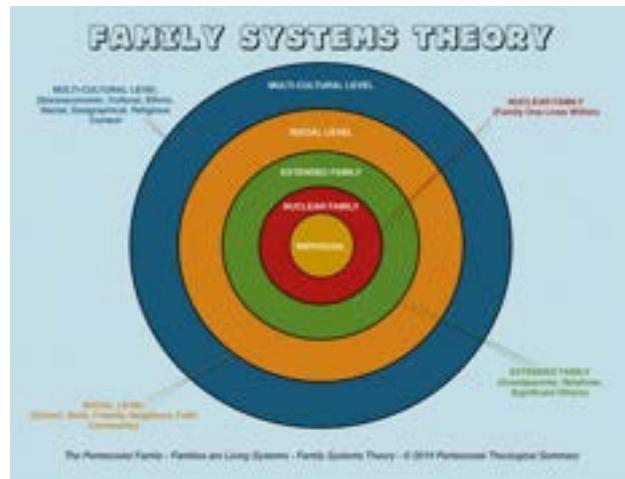
Systems science

Systems science, also referred to as systems research, or, simply, systems, is an interdisciplinary field concerned with understanding systems?from simple to complex?in nature, society, cognition, engineering, technology and science itself. The field is diverse, spanning the formal, natural, social, and applied sciences.



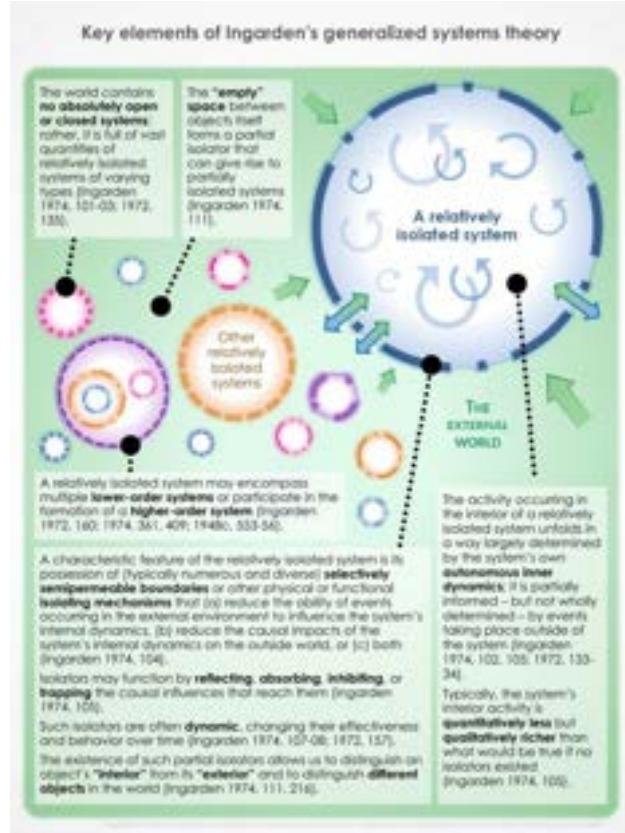
Systems theory

Systems theory is the interdisciplinary study of systems, i.e. cohesive groups of interrelated, interdependent components that can be natural or human-made. Every system has causal boundaries, is influenced by its context, defined by its structure, function and role, and expressed through its relations with other systems. A system is "more than the sum of its parts" by expressing synergy or emergent behavior.



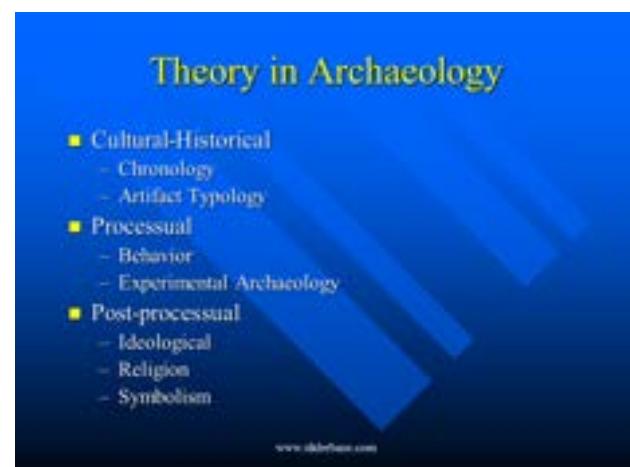
Systems theory in anthropology

Systems theory in anthropology is an interdisciplinary, non-representative, non-referential, and non-Cartesian approach that brings together natural and social sciences to understand society in its complexity. The basic idea of a system theory in social science is to solve the classical problem of duality; mind-body, subject-object, form-content, signifier-signified, and structure-agency. System theory suggests that instead of creating closed categories into binaries (subject-object); the system should stay open so as to allow free flow of process and interactions. In this way the binaries are dissolved.



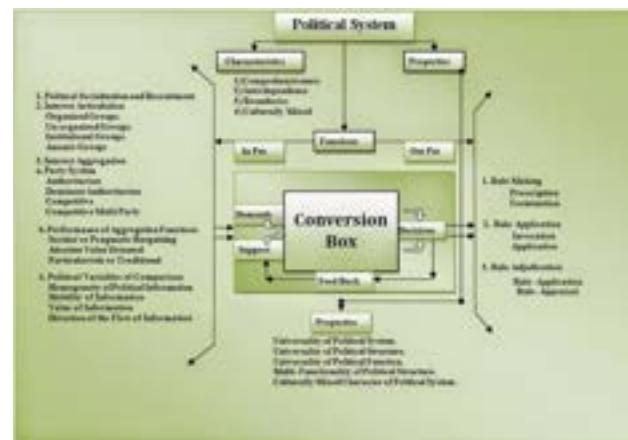
Systems theory in archaeology

Systems theory in archaeology is the application of systems theory and systems thinking in archaeology. It originated with the work of Ludwig von Bertalanffy in the 1950s, and is introduced in archaeology in the 1960s with the work of Sally R. Binford & Lewis Binford's "New Perspectives in Archaeology" and Kent V. Flannery's "Archaeological Systems Theory and Early Mesoamerica".



Systems theory in political science

Systems theory in political science is a highly abstract, partly holistic view of politics, influenced by cybernetics. The adaptation of system theory to political science was conceived by David Easton in 1953.



Systems thinking

Systems thinking is a way of making sense of the complexity of the world by looking at it in terms of wholes and relationships rather than by splitting it down into its parts. It has been used as a way of exploring and developing effective action in complex contexts, enabling systems change. Systems thinking draws on and contributes to systems theory and the system sciences.



TOPS-10

TOPS-10 System (Timesharing / Total Operating System-10) is a discontinued operating system from Digital Equipment Corporation (DEC) for the PDP-10 (or DECsysten-10) mainframe computer family. Launched in 1967, TOPS-10 evolved from the earlier "Monitor" software for the PDP-6 and PDP-10 computers; this was renamed to TOPS-10 in 1970.



TOPS-20

The TOPS-20 operating system by Digital Equipment Corporation (DEC) is a proprietary OS used on some of DEC's 36-bit mainframe computers. The Hardware Reference Manual was described as for "DECsystem-10/DECSYSTEM-20 Processor" (meaning the DEC PDP-10 and the DECSYSTEM-20). TOPS-20 began in 1969 as the TENEX operating system of Bolt, Beranek and Newman (BBN) and shipped as a product by DEC starting in 1976. TOPS-20 is almost entirely unrelated to the similarly named TOPS-10, but it was shipped with the PA1050 TOPS-10 Monitor Calls emulation facility which allowed most, but not all, TOPS-10 executables to run unchanged. As a matter of policy, DEC did not update PA1050 to support later TOPS-10 additions except where required by DEC software.



TOS/360

Disk Operating System/360, also DOS/360, or simply DOS, is the discontinued first member of a sequence of operating systems for IBM System/360, System/370 and later mainframes. It was announced by IBM on the last day of 1964, and it was first delivered in June 1966. In its time, DOS/360 was the most widely used operating system in the world.



TSS/360

The IBM Time Sharing System TSS/360 is a discontinued early time-sharing operating system designed exclusively for a special model of the System/360 line of mainframes, the Model 67. Made available on a trial basis to a limited set of customers in 1967, it was never officially released as a supported product by IBM. TSS pioneered a number of novel features, some of which later appeared in more popular systems such as MVS. TSS was migrated to System/370 and 303x systems, but despite its many advances and novel capabilities, TSS failed to meet expectations and was eventually canceled. TSS/370 was used as the basis for a port of UNIX to the IBM mainframe. TSS/360 also inspired the development of the TSS/8 operating system.



Tablet computer

A tablet computer, commonly shortened to tablet, is a mobile device, typically with a mobile operating system and touchscreen display processing circuitry, and a rechargeable battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but lack some input/output (I/O) abilities that others have. Modern tablets largely resemble modern smartphones, the only differences being that tablets are relatively larger than smartphones, with screens 7 inches (18 cm) or larger, measured diagonally, and may not support access to a cellular network. Unlike laptops (which have traditionally run off operating systems usually designed for desktops), tablets usually run mobile operating systems, alongside smartphones.



Talcott Parsons

Talcott Parsons (December 13, 1902 ? May 8, 1979) was an American sociologist of the classical tradition, best known for his social action theory and structural functionalism.

Parsons is considered one of the most influential figures in sociology in the 20th century. After earning a PhD in economics, he served on the faculty at Harvard University from 1927 to 1973. In 1930, he was among the first professors in its new sociology department. Later, he was instrumental in the establishment of the Department of Social Relations at Harvard.



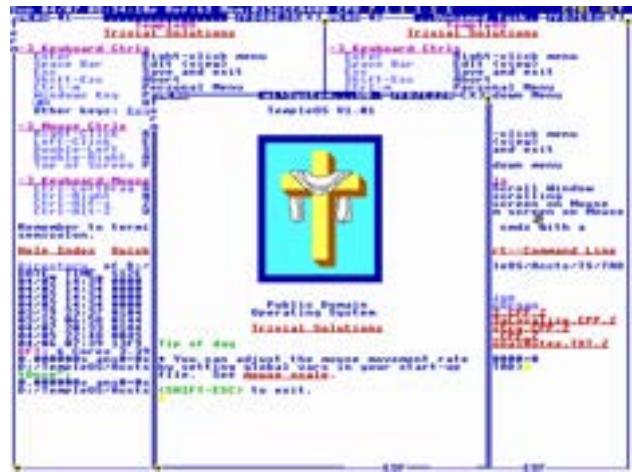
Tandem

Tandem, or in tandem, is an arrangement in which a team of machines, animals or people are lined up one behind another, all facing in the same direction. The original use of the term in English was in tandem harness, which is used for two or more draft horses, or other draft animals, harnessed in a single line one behind another, as opposed to a pair, harnessed side by side, or a team of several pairs. The tandem harness allows additional animals to provide pulling power for a vehicle designed for a single animal.



TempleOS

TempleOS (formerly J Operating System, LoseThos, and SparrowOS) is a biblical-themed lightweight operating system (OS) designed to be the Third Temple prophesied in the Bible. It was created by American programmer Terry A. Davis, who developed it alone over the course of a decade after a series of manic episodes that he later described as a revelation from God.



The Open Group

The Open Group is a global consortium that seeks to "enable the achievement of business objectives" by developing "open, vendor-neutral technology standards and certifications." It has over 840 member organizations and provides a number of services, including strategy, management, innovation and research, standards, certification, and test development. It was established in 1996 when X/Open merged with the Open Software Foundation.



Theoretical computer science

Theoretical computer science (TCS) is a subset of general computer science and mathematics that focuses on mathematical aspects of computer science such as the theory of computation, lambda calculus, and type theory.



Strictly as per the New Revised Syllabus (REV- 2019 'C' Scheme)
of Mumbai University w.e.f. academic year 2021-22

Theoretical Computer Science

(Code : CSC501)

Semester V - Computer Engineering

Dilip Kumar Sultania

Includes :
• Solved Latest University Question Papers



Theory of computation

In theoretical computer science and mathematics, the theory of computation is the branch that deals with what problems can be solved on a model of computation, using an algorithm, how efficiently they can be solved or to what degree (e.g., approximate solutions versus precise ones). The field is divided into three major branches: automata theory and formal languages, computability theory, and computational complexity theory, which are linked by the question: "What are the fundamental capabilities and limitations of computers?". In order to perform a rigorous study of computation, computer scientists work with a mathematical abstraction of computers called a model of computation. There are several models in use, but the most commonly examined is the Turing machine. Computer scientists study the Turing machine because it is simple to formulate, can be analyzed and used to prove results, and because it represents what many consider the most powerful possible "reasonable" model of computation (see Church-Turing thesis). It might seem that the potentially infinite memory capacity is an unrealizable attribute, but any decidable problem solved by a Turing machine will always require only a finite amount of memory. So in principle, any problem that can be solved (decided) by a Turing machine can be solved by a computer that has a finite amount of memory.

Transition Systems

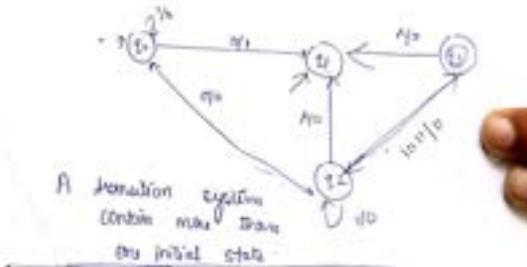
A transition graph or transition system is a finite directed labeled graph in which each node represents a state and directed edges indicate the transition of state.

1. edges are labelled with input/output

A transition system is a 5-tuple $(S, \Sigma, \delta, q_0, F)$

$S \subseteq \Omega$, Ω is nonempty

Σ is a finite subset of $\Omega^* \times \Omega$



Acceptance of string by DFA

$M(S, \Sigma, \delta, q_0, F)$

If $\delta(q_0, x) = q$ for some $q \in F$
Final state \rightarrow called as accepting state

A virus

Thomas E. Anderson

Thomas E. Anderson (born August 28, 1961) is an American computer scientist noted for his research on distributed computing, networking and operating systems.



Thread (computing)

In computer science, a thread of execution is the smallest sequence of programmed instructions that can be managed independently by a scheduler, which is typically a part of the operating system. The implementation of threads and processes differs between operating systems. In Modern Operating Systems, Tanenbaum shows that many distinct models of process organization are possible. In many cases, a thread is a component of a process. The multiple threads of a given process may be executed concurrently (via multithreading capabilities), sharing resources such as memory, while different processes do not share these resources. In particular, the threads of a process share its executable code and the values of its dynamically allocated variables and non-thread-local global variables at any given time.

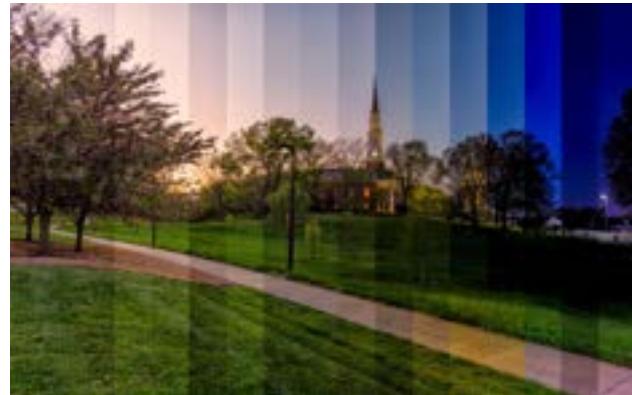
Tim Berners-Lee

Sir Timothy John Berners-Lee, (born 8 June 1955), also known as TimBL, is an English computer scientist best known as the inventor of the World Wide Web. He is a professorial research fellow at the University of Oxford and a professor emeritus at the Massachusetts Institute of Technology (MIT). Berners-Lee proposed an information management system on 12 March 1989, then implemented the first successful communication between a Hypertext Transfer Protocol (HTTP) client and server via the Internet in mid-November. Berners-Lee is the director of the World Wide Web Consortium (W3C), which oversees the continued development of the Web. He co-founded (with his then-wife-to-be Rosemary Leith) the World Wide Web Foundation. He is a senior researcher and holder of the 3Com founder's chair at the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL). He is a director of the Web Science Research Initiative (WSRI) and a member of the advisory board of the MIT Center for Collective Intelligence. In 2011, he was named as a member of the board of trustees of the Ford Foundation. He is a founder and president of the Open Data Institute and is currently an advisor at social network MeWe. He devised and implemented the first Web browser and Web server, and helped foster the Web's subsequent explosive development. He currently directs the W3 Consortium, developing tools and standards to further the Web's potential. In April 2009, he was elected as Foreign Associate of the National Academy of Sciences. In 2004, Berners-Lee was knighted by Queen Elizabeth II for his pioneering work. He was named in Time magazine's list of the 100 Most Important People of the 20th century and has received a number of other accolades for his invention.



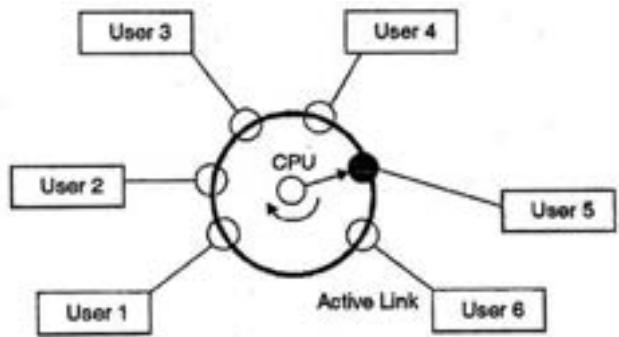
Time slice

In computing, preemption is the act of temporarily interrupting an executing task, with the intention of resuming it at a later time. This interrupt is done by an external scheduler with no assistance or cooperation from the task.^{:?153?} This preemptive scheduler usually runs in the most privileged protection ring, meaning that interruption and resuming are considered highly secure actions. Such a change in the currently executing task of a processor is known as context switching.



Time-sharing

In computing, time-sharing is the sharing of a computing resource among many users at the same time by means of multiprogramming and multi-tasking. Its emergence as the prominent model of computing in the 1970s represented a major technological shift in the history of computing. By allowing many users to interact concurrently with a single computer, time-sharing dramatically lowered the cost of providing computing capability, made it possible for individuals and organizations to use a computer without owning one, and promoted the interactive use of computers and the development of new interactive applications.



Timeline of operating systems

This article presents a timeline of events in the history of computer operating systems from 1951 to the current day. For a narrative explaining the overall developments, see the [History of operating systems](#).



Transaction Processing Facility

Transaction Processing Facility (TPF) is an IBM real-time operating system for mainframe computers descended from the IBM System/360 family, including zSeries and System z9.



Trusted Computer System Evaluation Criteria

Trusted Computer System Evaluation Criteria (TCSEC) is a United States Government Department of Defense (DoD) standard that sets basic requirements for assessing the effectiveness of computer security controls built into a computer system. The TCSEC was used to evaluate, classify, and select computer systems being considered for the processing, storage, and retrieval of sensitive or classified information. The TCSEC, frequently referred to as the Orange Book, is the centerpiece of the DoD Rainbow Series publications. Initially issued in 1983 by the National Computer Security Center (NCSC), an arm of the National Security Agency, and then updated in 1985, TCSEC was eventually replaced by the Common Criteria international standard, originally published in 2005.

Trusted Computer System Evaluation Criteria (TCSEC)

- D – žiadna ochrana
- C – diskrétné riadenie prístupu
 - C1 – nepovinná vzájomná ochrana používateľov
 - C2 – voliteľné riadenie prístupu
- B – povinné riadenie prístupu
 - B1 - povinné riadenie prístupu
 - B2 – struktúrovaná ochrana
 - B3 – bezpečnostné domény
- A – verifikovaný návrh
 - funkčná zhoda s B3 + formálne preveriteľné vlastnosti

Trusted operating system

Trusted Operating System (TOS) generally refers to an operating system that provides sufficient support for multilevel security and evidence of correctness to meet a particular set of government requirements.

Security Models and Designing a
Trusted Operating System

MANIKANDAN SUBBU

Tux (mascot)

Tux is a penguin character and the official brand character of the Linux kernel.

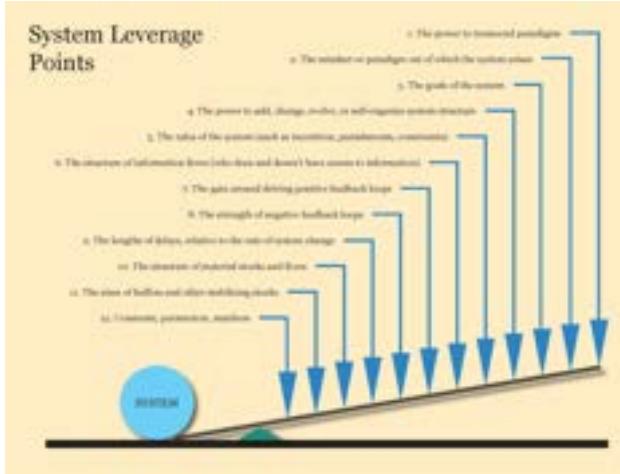
Originally created as an entry to a Linux logo competition, Tux is the most commonly used icon for Linux, although different Linux distributions depict Tux in various styles.

The character is used in many other Linux programs and as a general symbol of Linux.



Twelve leverage points

The twelve leverage points to intervene in a system were proposed by Donella Meadows, a scientist and system analyst who studied environmental limits to economic growth.



UNIVAC

UNIVAC (Universal Automatic Computer) was a line of electronic digital stored-program computers starting with the products of the Eckert?Mauchly Computer Corporation. Later the name was applied to a division of the Remington Rand company and successor organizations.



UNIVAC 1108

The UNIVAC 1100/2200 series is a series of compatible 36-bit computer systems, beginning with the UNIVAC 1107 in 1962, initially made by Sperry Rand. The series continues to be supported today by Unisys Corporation as the ClearPath Dorado Series. The solid-state 1107 model number was in the same sequence as the earlier vacuum-tube computers, but the early computers were not compatible with the solid-state successors.



UNIX

Unix (; trademarked as UNIX) is a family of multitasking, multiuser computer operating systems that derive from the original AT&T Unix, whose development started in 1969 at the Bell Labs research center by Ken Thompson, Dennis Ritchie, and others. Initially intended for use inside the Bell System, AT&T licensed Unix to outside parties in the late 1970s, leading to a variety of both academic and commercial Unix variants from vendors including University of California, Berkeley (BSD), Microsoft (Xenix), Sun Microsystems (SunOS/Solaris), HP/HPE (HP-UX), and IBM (AIX). In the early 1990s, AT&T sold its rights in Unix to Novell, which then sold the UNIX trademark to The Open Group, an industry consortium founded in 1996. The Open Group allows the use of the mark for certified operating systems that comply with the Single UNIX Specification (SUS).

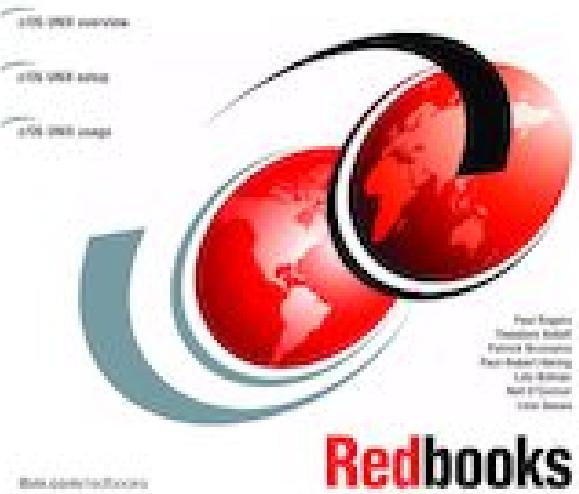


UNIX System Services

z/OS UNIX System Services (z/OS UNIX, or informally USS) is a base element of z/OS. z/OS UNIX is a certified UNIX operating system implementation (XPG4 UNIX 95) optimized for mainframe architecture. It is the first UNIX 95 to not be derived from the AT&T source code. Through integration with the rest of z/OS, additional Time Sharing Option (TSO) commands are available alongside the usual UNIX services, making it possible to process UNIX files using ISPF. Extensions in JCL make it possible to use these files in batch processing.

IBM

UNIX System Services z/OS Version 1 Release 7 Implementation



USB flash drive

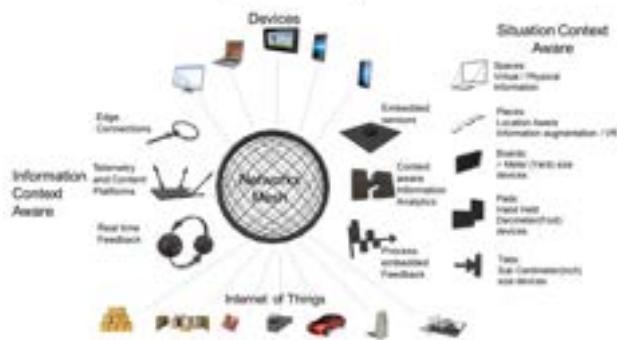
A USB flash drive (also called a thumb drive in the US, or a memory stick in the UK) is a data storage device that includes flash memory with an integrated USB interface. It is typically removable, rewritable and much smaller than an optical disc. Most weigh less than 30 g (1 oz). Since first appearing on the market in late 2000, as with virtually all other computer memory devices, storage capacities have risen while prices have dropped. As of March 2016, flash drives with anywhere from 8 to 256 gigabytes (GB) were frequently sold, while 512 GB and 1 terabyte (TB) units were less frequent. As of 2018, 2 TB flash drives were the largest available in terms of storage capacity. Some allow up to 100,000 write/erase cycles, depending on the exact type of memory chip used, and are thought to physically last between 10 and 100 years under normal circumstances (shelf storage time).



Ubiquitous computing

Ubiquitous computing (or "ubicomp") is a concept in software engineering, hardware engineering and computer science where computing is made to appear anytime and everywhere. In contrast to desktop computing, ubiquitous computing can occur using any device, in any location, and in any format. A user interacts with the computer, which can exist in many different forms, including laptop computers, tablets, smart phones and terminals in everyday objects such as a refrigerator or a pair of glasses. The underlying technologies to support ubiquitous computing include Internet, advanced middleware, operating system, mobile code, sensors, microprocessors, new I/O and user interfaces, computer networks, mobile protocols, location and positioning, and new materials.

Ubiquitous Systems



Ubuntu (operating system)

Ubuntu (listen) uu-BUUN-too) is a Linux distribution based on Debian and composed mostly of free and open-source software. Ubuntu is officially released in three editions: Desktop, Server, and Core for Internet of things devices and robots. All of the editions can run on a computer alone, or in a virtual machine. Ubuntu is a popular operating system for cloud computing, with support for OpenStack. Ubuntu's default desktop changed back from the in-house Unity to GNOME after nearly 6.5 years in 2017 upon the release of version 17.10. Ubuntu is released every six months, with long-term support (LTS) releases every two years. As of October 2022, the most-recent release is 22.10 ("Kinetic Kudu"), and the current long-term support release is 22.04 ("Jammy Jellyfish").



Unikernel

A unikernel is a specialised, single address space machine image constructed by using library operating systems. A developer selects, from a modular stack, the minimal set of libraries which correspond to the OS constructs required for the application to run. These libraries are then compiled with the application and configuration code to build sealed, fixed-purpose images (unikernels) which run directly on a hypervisor or hardware without an intervening OS such as Linux or Windows.



Unisys

Unisys Corporation is an American multinational information technology (IT) services and consulting company founded in 1986 and headquartered in Blue Bell, Pennsylvania. The company has offices globally and provides digital workplace, cloud applications & infrastructure, enterprise computing and business process services to the world's leading organizations.



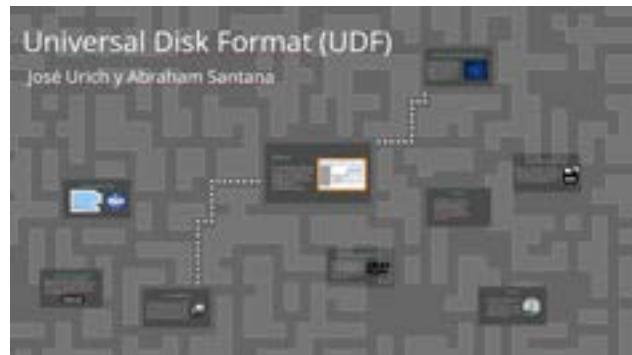
United States Department of Defense

The United States Department of Defense (DoD, USDOD or DOD) is an executive branch department of the federal government charged with coordinating and supervising all agencies and functions of the U.S. government directly related to national security and the United States Armed Forces. The DoD is the largest employer in the world, with over 1.34 million active-duty service members (soldiers, marines, sailors, airmen, and guardians) as of June 2022. The DoD also maintains over 778,000 National Guard and reservists, and over 747,000 civilians bringing the total to over 2.87 million employees. Headquartered at the Pentagon in Arlington, Virginia, just outside Washington, D.C., the DoD's stated mission is to provide "the military forces needed to deter war and ensure our nation's security". The Department of Defense is headed by the secretary of defense, a cabinet-level head who reports directly to the president of the United States. Beneath the Department of Defense are three subordinate military departments: the Department of the Army, the Department of the Navy, and the Department of the Air Force. In addition, four national intelligence services are subordinate to the Department of Defense: the Defense Intelligence Agency (DIA), the National Security Agency (NSA), the National Geospatial-Intelligence Agency (NGA), and the National Reconnaissance Office (NRO).



Universal Disk Format

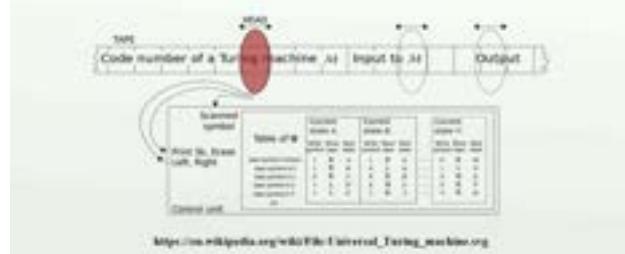
Universal Disk Format (UDF) is an open, vendor-neutral file system for computer data storage for a broad range of media. In practice, it has been most widely used for DVDs and newer optical disc formats, supplanting ISO 9660. Due to its design, it is very well suited to incremental updates on both recordable and (re)writable optical media. UDF was developed and maintained by the Optical Storage Technology Association (OSTA).



Universal Turing machine

In computer science, a universal Turing machine (UTM) is a Turing machine that can simulate an arbitrary Turing machine on arbitrary input. The universal machine essentially achieves this by reading both the description of the machine to be simulated as well as the input to that machine from its own tape. Alan Turing introduced the idea of such a machine in 1936?1937. This principle is considered to be the origin of the idea of a stored-program computer used by John von Neumann in 1946 for the "Electronic Computing Instrument" that now bears von Neumann's name: the von Neumann architecture. In terms of computational complexity, a multi-tape universal Turing machine need only be slower by logarithmic factor compared to the machines it simulates.

Universal Turing machine



https://en.wikipedia.org/wiki/File:Universal_Turing_machine.org

University of California, Berkeley

The University of California, Berkeley (UC Berkeley, Berkeley, Cal, or California) is a public land-grant research university in Berkeley, California. Established in 1868 as the University of California, it is the state's first land-grant university and the founding campus of the University of California system. Its fourteen colleges and schools offer over 350 degree programs and enroll some 32,000 undergraduate and 13,000 graduate students. Berkeley ranks among the world's top universities. A founding member of the Association of American Universities, Berkeley hosts many leading research institutes dedicated to science, engineering, and mathematics. The university founded and maintains close relationships with three national laboratories at Berkeley, Livermore and Los Alamos, and has played a prominent role in many scientific advances, from the Manhattan Project and the discovery of 16 chemical elements to breakthroughs in computer science and genomics. Berkeley is also known for political activism and the Free Speech Movement of the 1960s. Berkeley's athletic teams, which compete as the California Golden Bears primarily in the Pac-12 Conference, have won 107 national championships, and its students and alumni have won 223 Olympic medals (including 121 gold medals). Among its alumni, faculty and researchers, Berkeley has more Nobel laureates (107), Turing Award winners (25), Fields Medalists (14), and Wolf Prize winners (30) than any other public university in the nation; it is affiliated with 34 Pulitzer Prizes, 19 Academy Awards, and more MacArthur "Genius Grants" (108) and National Medals of Science (68) than any other public institution.



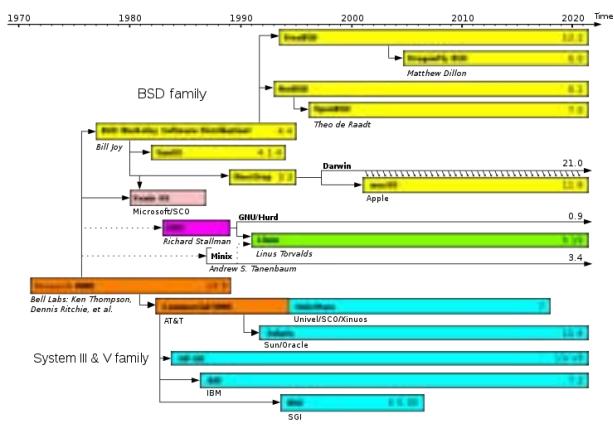
Unix

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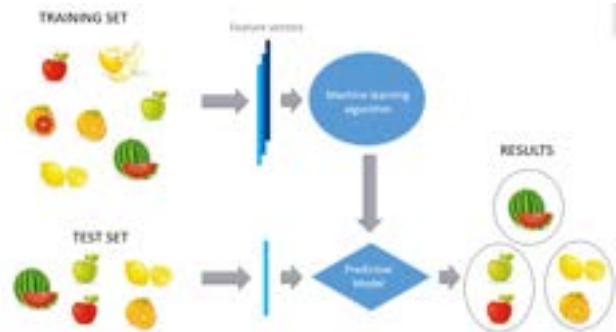
Unix-like

A Unix-like (sometimes referred to as UN*X or *nix) operating system is one that behaves in a manner similar to a Unix system, although not necessarily conforming to or being certified to any version of the Single UNIX Specification. A Unix-like application is one that behaves like the corresponding Unix command or shell. Although there are general philosophies for Unix design, there is no technical standard defining the term, and opinions can differ about the degree to which a particular operating system or application is Unix-like.



Unsupervised learning

Unsupervised learning is a type of algorithm that learns patterns from untagged data. The goal is that through mimicry, which is an important mode of learning in people, the machine is forced to build a concise representation of its world and then generate imaginative content from it.



Urban metabolism

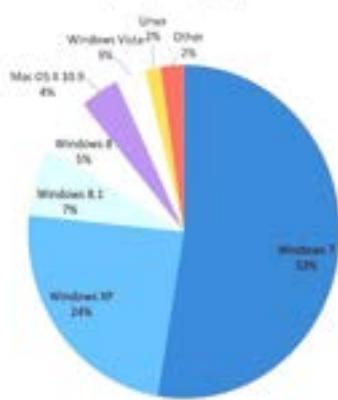
Urban metabolism is a model to facilitate the description and analysis of the flows of the materials and energy within cities, such as undertaken in a material flow analysis of a city. It provides researchers with a metaphorical framework to study the interactions of natural and human systems in specific regions. From the beginning, researchers have tweaked and altered the parameters of the urban metabolism model. C. Kennedy and fellow researchers have produced a clear definition in the 2007 paper *The Changing Metabolism of Cities* claiming that urban metabolism is "the sum total of the technical and socio-economic process that occur in cities, resulting in growth, production of energy and elimination of waste." With the growing concern of climate change and atmospheric degradation, the use of the urban metabolism model has become a key element in determining and maintaining levels of sustainability and health in cities around the world. Urban metabolism provides a unified or holistic viewpoint to encompass all of the activities of a city in a single model.



Usage share of operating systems

The usage share of operating systems is the percentage of computing devices that run each operating system (OS) at any particular time. All such figures are necessarily estimates because data about operating system share is difficult to obtain. There are few reliable primary sources and no agreed methodologies for its collection. Operating systems are used in numerous device types, from embedded devices without a screen through to supercomputers.

Global Desktop Operating System Market Share



Usenet newsgroup

A Usenet newsgroup is a repository usually within the Usenet system, for messages posted from users in different locations using the Internet. They are discussion groups and are not devoted to publishing news. Newsgroups are technically distinct from, but functionally similar to, discussion forums on the World Wide Web.

Newsreader software is used to read the content of newsgroups.



User (computing)

A user is a person who utilizes a computer or network service.



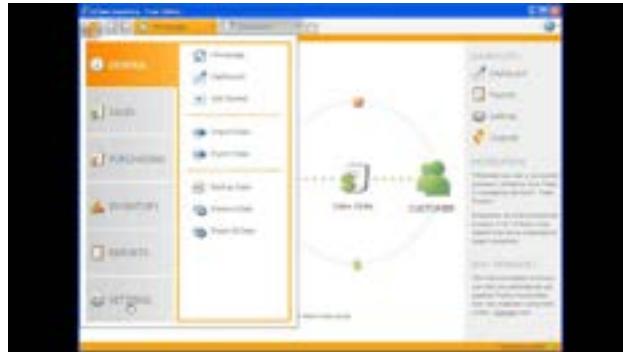
User interface

In the industrial design field of human-computer interaction, a user interface (UI) is the space where interactions between humans and machines occur. The goal of this interaction is to allow effective operation and control of the machine from the human end, while the machine simultaneously feeds back information that aids the operators' decision-making process. Examples of this broad concept of user interfaces include the interactive aspects of computer operating systems, hand tools, heavy machinery operator controls and process controls. The design considerations applicable when creating user interfaces are related to, or involve such disciplines as, ergonomics and psychology.



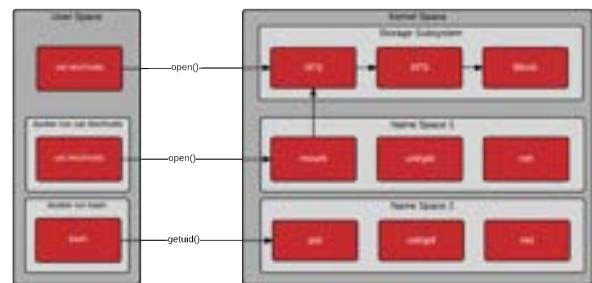
User mode

A modern computer operating system usually segregates virtual memory into user space and kernel space. Primarily, this separation serves to provide memory protection and hardware protection from malicious or errant software behaviour.



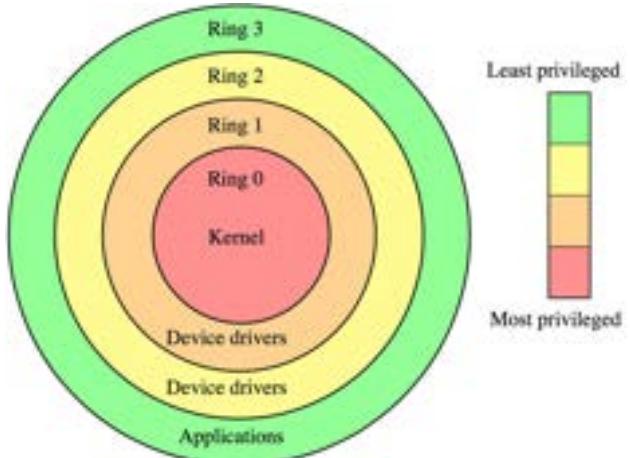
User space

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User space and kernel space

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VAX

VAX (an acronym for Virtual Address eXtension) is a series of computers featuring a 32-bit instruction set architecture (ISA) and virtual memory that was developed and sold by Digital Equipment Corporation (DEC) in the late 20th century. The VAX-11/780, introduced October 25, 1977, was the first of a range of popular and influential computers implementing the VAX ISA. The VAX family was a huge success for DEC ? over 100 models were introduced over the lifetime of the design, with the last members arriving in the early 1990s. The VAX was succeeded by the DEC Alpha, which included several features from VAX machines to make porting from the VAX easier.



VMS Software Inc

OpenVMS, often referred to as just VMS, is a multi-user, multiprocessing and virtual memory-based operating system. It is designed to support time-sharing, batch processing, transaction processing and workstation applications. Customers using OpenVMS include banks and financial services, hospitals and healthcare, telecommunications operators, network information services, and industrial manufacturers. During the 1990s and 2000s, there were approximately half a million VMS systems in operation worldwide. It was first announced by Digital Equipment Corporation (DEC) as VAX/VMS (Virtual Address eXtension/Virtual Memory System) alongside the VAX-11/780 minicomputer in 1977. OpenVMS has subsequently been ported to run on DEC Alpha systems, the Itanium-based HPE Integrity Servers, and select x86-64 hardware and hypervisors. Since 2014, OpenVMS is developed and supported by VMS Software Inc. (VSI). OpenVMS offers high availability through clustering ? the ability to distribute the system over multiple physical machines. This allows clustered applications and data to remain continuously available while operating system software and hardware maintenance and upgrades are performed, or if part of the cluster is destroyed. VMS cluster uptimes of 17 years have been reported.



Very Large Scale Integration

Very large-scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining millions or billions of MOS transistors onto a single chip. VLSI began in the 1970s when MOS integrated circuit (Metal Oxide Semiconductor) chips were developed and then widely adopted, enabling complex semiconductor and telecommunication technologies. The microprocessor and memory chips are VLSI devices.



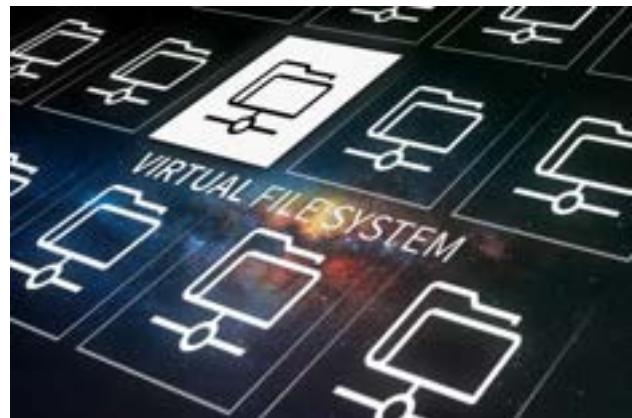
Video game

A video game is an electronic game that involves interaction with a user interface or input device such as a joystick, controller, keyboard or motion sensing device to generate visual feedback from a display device, most commonly shown in a video format on a television set, computer monitor, flat-panel display/touchscreen on handheld devices or virtual reality headset, hence the name. However, not all video games are dependent on graphical outputs, for example text adventure games and computer chess can be played through teletype printers. Most modern video games are audiovisual, with audio complement delivered through speakers or headphones, and sometimes also with other types of sensory feedbacks (e.g. haptic technology that provides tactile sensations), and some video games also allow microphone and/or webcam inputs for in-game chatting and livestreaming.



Virtual file system

A virtual file system (VFS) or virtual filesystem switch is an abstract layer on top of a more concrete file system. The purpose of a VFS is to allow client applications to access different types of concrete file systems in a uniform way. A VFS can, for example, be used to access local and network storage devices transparently without the client application noticing the difference. It can be used to bridge the differences in Windows, classic Mac OS/macOS and Unix filesystems, so that applications can access files on local file systems of those types without having to know what type of file system they are accessing.



Virtual machine

In computing, a virtual machine (VM) is the virtualization/emulation of a computer system. Virtual machines are based on computer architectures and provide functionality of a physical computer. Their implementations may involve specialized hardware, software, or a combination.

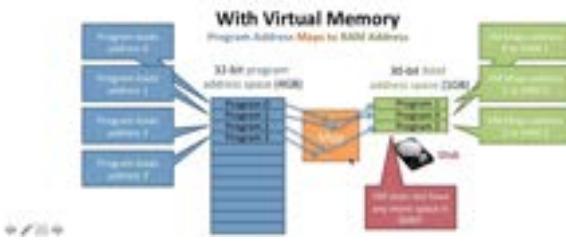


Virtual memory

In computing, virtual memory, or virtual storage is a memory management technique that provides an "idealized abstraction of the storage resources that are actually available on a given machine" which "creates the illusion to users of a very large (main) memory". The computer's operating system, using a combination of hardware and software, maps memory addresses used by a program, called virtual addresses, into physical addresses in computer memory. Main storage, as seen by a process or task, appears as a contiguous address space or collection of contiguous segments. The operating system manages virtual address spaces and the assignment of real memory to virtual memory. Address translation hardware in the CPU, often referred to as a memory management unit (MMU), automatically translates virtual addresses to physical addresses. Software within the operating system may extend these capabilities, utilizing, e.g., disk storage, to provide a virtual address space that can exceed the capacity of real memory and thus reference more memory than is physically present in the computer.

Solving the problems: #1 not enough memory

- Map some of the program's address space to the disk
- When we need it, we bring it into memory



Virtual reality

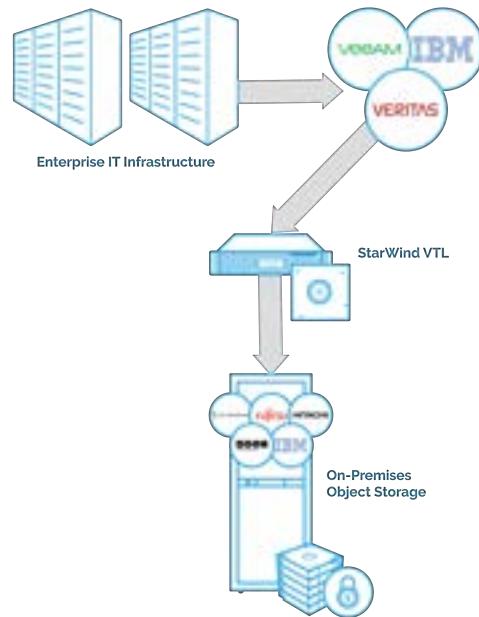
Virtual reality (VR) is a simulated experience that employs pose tracking and 3D near-eye displays to give the user an immersive feel of a virtual world. Applications of virtual reality include entertainment (particularly video games), education (such as medical or military training) and business (such as virtual meetings). Other distinct types of VR-style technology include augmented reality and mixed reality, sometimes referred to as extended reality or XR, although definitions are currently changing due to the nascence of the industry. Currently, standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate some realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world, move around in it, and interact with virtual features or items.

The effect is commonly created by VR headsets consisting of a head-mounted display with a small screen in front of the eyes, but can also be created through specially designed rooms with multiple large screens. Virtual reality typically incorporates auditory and video feedback, but may also allow other types of sensory and force feedback through haptic technology.



Virtual tape library

A virtual tape library (VTL) is a data storage virtualization technology used typically for backup and recovery purposes. A VTL presents a storage component (usually hard disk storage) as tape libraries or tape drives for use with existing backup software.



Visualization (graphics)

Visualization or visualisation (see spelling differences) is any technique for creating images, diagrams, or animations to communicate a message. Visualization through visual imagery has been an effective way to communicate both abstract and concrete ideas since the dawn of humanity. Examples from history include cave paintings, Egyptian hieroglyphs, Greek geometry, and Leonardo da Vinci's revolutionary methods of technical drawing for engineering and scientific purposes.



Vkernel

A virtual kernel architecture (vkernel) is an operating system virtualisation paradigm where kernel code can be compiled to run in the user space, for example, to ease debugging of various kernel-level components, in addition to general-purpose virtualisation and compartmentalisation of system resources. It is used by DragonFly BSD in its vkernel implementation since DragonFly 1.7, having been first revealed in September 2006 (2006-09), and first released in the stable branch with DragonFly 1.8 in January 2007 (2007-01).



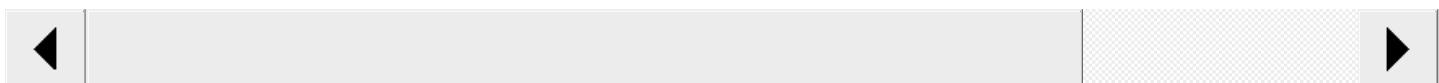
VxWorks

VxWorks is a real-time operating system (or RTOS) developed as proprietary software by Wind River Systems, a subsidiary of Aptiv. First released in 1987, VxWorks is designed for use in embedded systems requiring real-time, deterministic performance and, in many cases, safety and security certification for industries such as aerospace, defense, medical devices, industrial equipment, robotics, energy, transportation, network infrastructure, automotive, and consumer electronics. VxWorks supports AMD/Intel architecture, POWER architecture, ARM architectures and RISC-V. The RTOS can be used in multicore asymmetric multiprocessing (AMP), symmetric multiprocessing (SMP), and mixed modes and multi-OS (via Type 1 hypervisor) designs on 32- and 64-bit processors. VxWorks comes with the kernel, middleware, board support packages, Wind River Workbench development suite and complementary third-party software and hardware technologies. In its latest release, VxWorks 7, the RTOS has been re-engineered for modularity and upgradeability so the OS kernel is separate from middleware, applications and other packages. Scalability, security, safety, connectivity, and graphics have been improved to address Internet of Things (IoT) needs.



WIMP (computing)

In human-computer interaction, WIMP stands for "windows, icons, menus, pointer", denoting a style of interaction using these elements of the user interface. Other expansions are sometimes used, such as substituting "mouse" and "mice" for menus, or "pull-down menu" and "pointing" for pointer. Though the acronym has fallen into disuse, it has often been likened to the term graphical user interface (GUI). Any interface that uses graphics can be called a GUI, and WIMP systems derive from such systems. However, while all WIMP systems use graphics as a key element (the icon and pointer elements), and therefore are GUIs, the reverse is not true. Some GUIs are not based in windows, icons, menus, and pointers. For example, most mobile phones represent actions as icons and menus, but often do not rely on a conventional pointer or containerized windows to host program interactions. WIMP interaction was developed at Xerox PARC (see Xerox Alto, developed in 1973) and popularized with Apple's introduction of the Macintosh in 1984, which added the concepts of the "menu bar" and extended window management. The WIMP interface has the following components:



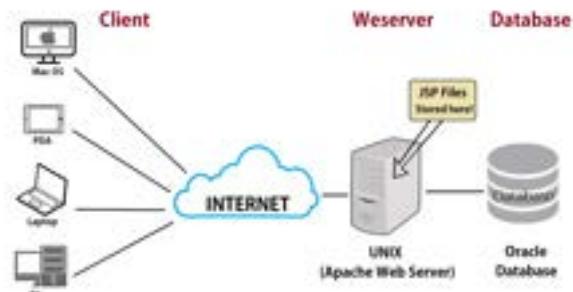
Wayback Machine

The Wayback Machine is a digital archive of the World Wide Web founded by the Internet Archive, a nonprofit based in San Francisco, California. Created in 1996 and launched to the public in 2001, it allows the user to go "back in time" and see how websites looked in the past. Its founders, Brewster Kahle and Bruce Gilliat, developed the Wayback Machine to provide "universal access to all knowledge" by preserving archived copies of defunct web pages. Launched on May 10, 1996, the Wayback Machine had saved more than 38.2 million web pages at the end of 2009. As of 3 February 2023, the Wayback Machine has archived more than 783 billion web pages.



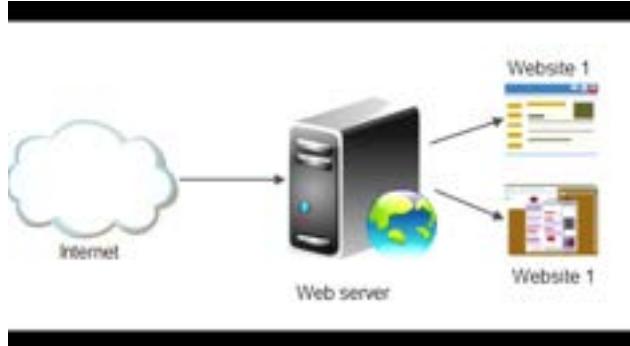
Web server

A web server is computer software and underlying hardware that accepts requests via HTTP (the network protocol created to distribute web content) or its secure variant HTTPS. A user agent, commonly a web browser or web crawler, initiates communication by making a request for a web page or other resource using HTTP, and the server responds with the content of that resource or an error message. A web server can also accept and store resources sent from the user agent if configured to do so. The hardware used to run a web server can vary according to the volume of requests that it needs to handle. At the low end of the range are embedded systems, such as a router that runs a small web server as its configuration interface. A high-traffic Internet website might handle requests with hundreds of servers that run on racks of high-speed computers.



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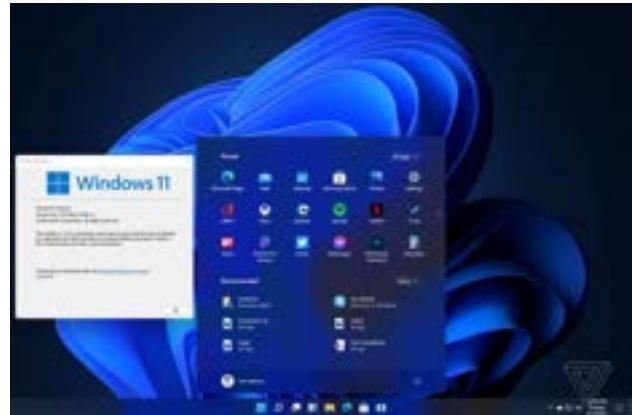
William Ross Ashby

W. Ross Ashby (6 September 1903 – 15 November 1972) was an English psychiatrist and a pioneer in cybernetics, the study of the science of communications and automatic control systems in both machines and living things. His first name was not used: he was known as Ross Ashby.^[91] His two books, *Design for a Brain* and *An Introduction to Cybernetics*, introduced exact and logical thinking into the brand new discipline of cybernetics and were highly influential.^[93] These "missionary works" along with his technical contributions made Ashby "the major theoretician of cybernetics after Wiener".^[28]



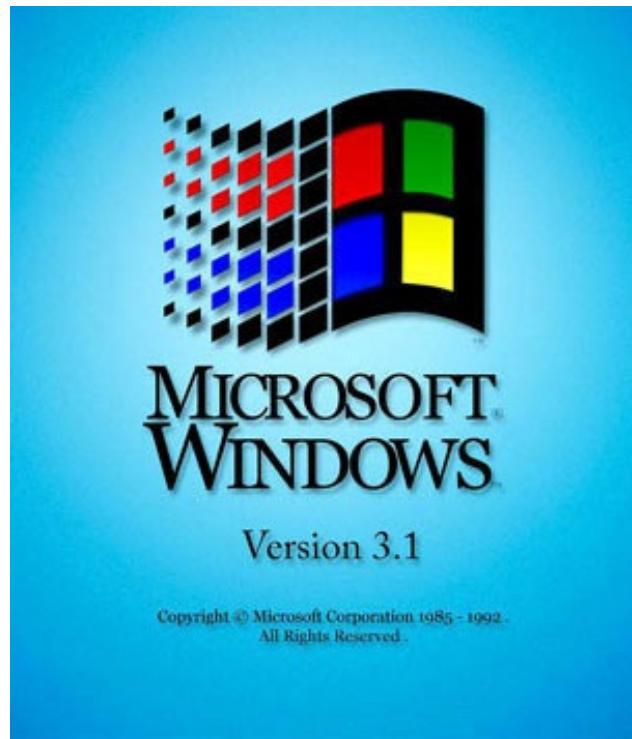
Windows 11

Windows 11 is the latest major release of Microsoft's Windows NT operating system, released in October 2021. It is a free upgrade to its predecessor, Windows 10 (2015), and is available for any Windows 10 devices that meet the new Windows 11 system requirements.



Windows 3.x

Windows 3.x means either of, or all of the following versions of Microsoft Windows:



ComputerHope.com

Windows 95

Windows 95 is a consumer-oriented operating system developed by Microsoft as part of its Windows 9x family of operating systems. The first operating system in the 9x family, it is the successor to Windows 3.1x, and was released to manufacturing on July 14, 1995, and generally to retail on August 24, 1995, almost three months after the release of Windows NT 3.51. Windows 95 merged Microsoft's formerly separate MS-DOS and Microsoft Windows products, and featured significant improvements over its predecessor, most notably in the graphical user interface (GUI) and in its simplified "plug-and-play" features. There were also major changes made to the core components of the operating system, such as moving from a mainly cooperatively multitasked 16-bit architecture to a 32-bit preemptive multitasking architecture, at least when running only 32-bit protected mode applications.



Windows 9x

Windows 9x is a generic term referring to a series of Microsoft Windows computer operating systems produced from 1995 to 2000, which were based on the Windows 95 kernel and its underlying foundation of MS-DOS, both of which were updated in subsequent versions. The first version in the 9x series was Windows 95, which was succeeded by Windows 98 and then Windows Me, which was the third and last version of Windows on the 9x line, until the series was superseded by Windows XP. Windows 9x is predominantly known for its use in home desktops. In 1998, Windows made up 82% of operating system market share. Internal release versions for versions of Windows 9x are 4.x. The internal versions for Windows 95, 98, and Me are 4.0, 4.1, and 4.9, respectively. Previous MS-DOS-based versions of Windows used version numbers of 3.2 or lower. Windows NT, which was aimed at professional users such as networks and businesses, used a similar but separate version number between 3.1 and 4.0. All versions of Windows from Windows XP onwards are based on the Windows NT codebase.



Windows CE

Windows Embedded Compact, formerly Windows Embedded CE, Windows Powered and Windows CE, is an operating system subfamily developed by Microsoft as part of its Windows Embedded family of products.



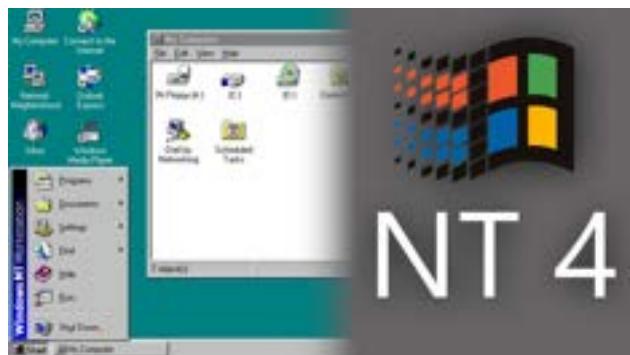
Windows ME

Windows Millennium Edition, or Windows Me (marketed with the pronunciation of the pronoun "me"), is an operating system developed by Microsoft as part of its Windows 9x family of Microsoft Windows operating systems. It is the successor to Windows 98, and was released to manufacturing on June 19, 2000, and then to retail on September 14, 2000. It was Microsoft's main operating system for home users until the introduction of its successor Windows XP in October 2001. Windows Me was targeted specifically at home PC users, and included Internet Explorer 5.5 (later default was Internet Explorer 6), Windows Media Player 7 (later default was Windows Media Player 9 Series) and the new Windows Movie Maker software, which provided basic video editing and was designed to be easy to use for consumers. Microsoft also incorporated features first introduced in Windows 2000, which had been released as a business-oriented operating system seven months earlier, into the graphical user interface, shell and Windows Explorer. Although Windows Me was still ultimately based around MS-DOS like its predecessors, access to real-mode DOS was restricted to decrease system boot time. Windows Me was initially positively received when it was released, but it soon garnered a negative reception from many users due to stability problems. Windows Me is now infamously known by many as one of the worst operating systems Microsoft has ever produced, being unfavorably compared with its immediate predecessor, Windows 98, several years before. In October 2001, Windows XP was released to the public, having already been under development at the time of Windows Me's release, and popularized most of Windows Me's features, while being far more stable because of it being based on the Windows NT kernel.



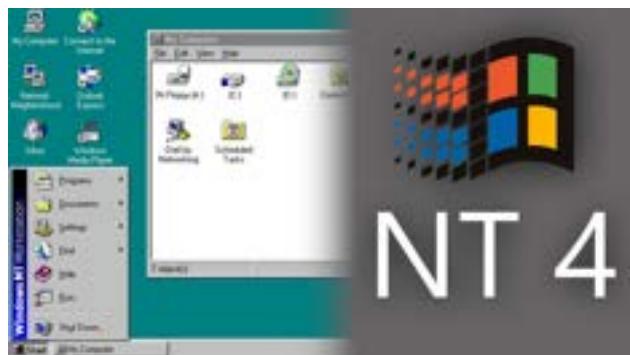
Windows NT

Windows NT is a proprietary graphical operating system produced by Microsoft, the first version of which was released on July 27, 1993. It is a processor-independent, multiprocessing and multi-user operating system.



Windows NT 4.0

Windows NT 4.0 is a major release of the Windows NT operating system developed by Microsoft and oriented towards businesses. It is the direct successor to Windows NT 3.51, and was released to manufacturing on July 31, 1996, and then to retail on August 24, 1996. It was Microsoft's primary business-oriented operating system until the introduction of Windows 2000. Workstation, server and embedded editions were sold, and all editions feature a graphical user interface similar to that of Windows 95, which was superseded by Windows 98 and could still be directly upgraded by either Windows 2000 Professional or Windows Me.



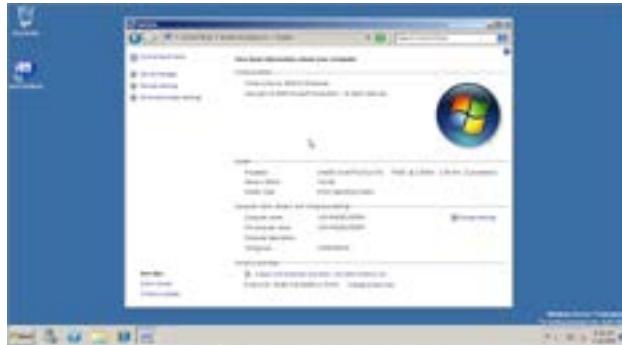
Windows Server 2003

Windows Server 2003, codenamed "Whistler Server", is the sixth version of Windows Server operating system produced by Microsoft. It is part of the Windows NT family of operating systems and was released to manufacturing on March 28, 2003 and generally available on April 24, 2003. Windows Server 2003 is the successor to the Server editions of Windows 2000 and the predecessor to Windows Server 2008. An updated version, Windows Server 2003 R2, was released to manufacturing on December 6, 2005. Windows Server 2003 is based on the consumer operating system, Windows XP. Windows Server 2003's kernel has also been used in Windows XP 64-bit Edition and Windows XP Professional x64 Edition, and was the starting point for the development of Windows Vista.



Windows Server 2008 R2

Windows Server 2008 R2, codenamed "Windows Server 7", is the fifth version of the Windows Server operating system produced by Microsoft and released as part of the Windows NT family of operating systems. It was released to manufacturing on July 22, 2009, and became generally available on October 22, 2009, shortly after the completion of Windows 7. It is the successor to Windows Server 2008, which is derived from the Windows Vista codebase, released the previous year, and was succeeded by the Windows 8-based Windows Server 2012.



Windows Vista

Windows Vista is a major release of the Windows NT operating system developed by Microsoft. It was the direct successor to Windows XP, which was released five years earlier, at the time being the longest time span between successive releases of Microsoft's Windows desktop operating systems. Development was completed on November 8, 2006, and over the following three months, it was released in stages to computer hardware and software manufacturers, business customers, and retail channels. On January 30, 2007, it was released internationally and made available for purchase and download from the Windows Marketplace; this is the first release of Windows to be made available through a digital distribution platform. New features of Windows Vista include an updated graphical user interface and visual style dubbed "Aero," a new search component called "Windows Search," redesigned networking, audio, print, and display sub-systems, and new multimedia tools such as Windows DVD Maker. Windows Vista aimed to increase the level of communication between machines on a home network, using peer-to-peer technology to simplify sharing files and media between computers and devices. Windows Vista included version 3.0 of the .NET Framework, allowing software developers to write applications without traditional Windows APIs. Windows Vista removed support for Itanium and devices without ACPI.



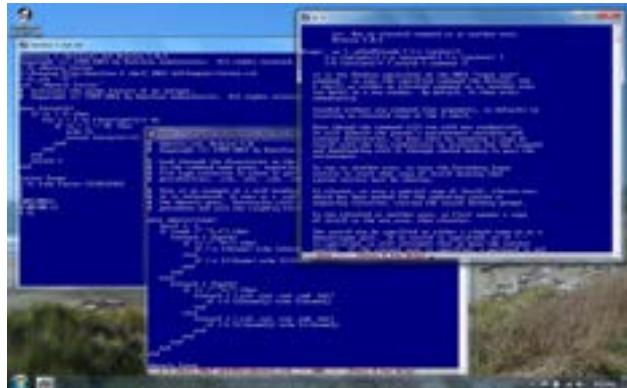
Windows XP

Windows XP is a major release of Microsoft's Windows NT operating system. It was released to manufacturing on August 24, 2001, and later to retail on October 25, 2001. It is a direct upgrade to its predecessors, Windows 2000 for high-end and business users and Windows Me for home users, and is available for any devices running Windows NT 4.0, Windows 98, Windows 2000, or Windows Me that meet the new Windows XP system requirements.



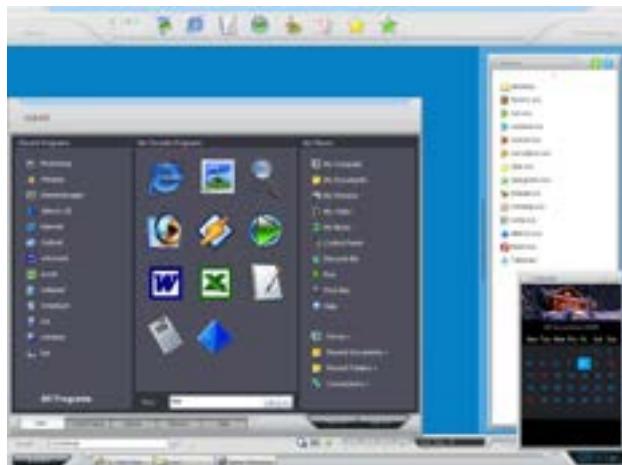
Windows shell

The Windows shell is the graphical user interface for the Microsoft Windows operating system. Its readily identifiable elements consist of the desktop, the taskbar, the Start menu, the task switcher and the AutoPlay feature. On some versions of Windows, it also includes Flip 3D and the charms. In Windows 10, the Windows Shell Experience Host interface drives visuals like the Start Menu, Action Center, Taskbar, and Task View/Timeline. However, the Windows shell also implements a shell namespace that enables computer programs running on Windows to access the computer's resources via the hierarchy of shell objects. "Desktop" is the top object of the hierarchy; below it there are a number of files and folders stored on the disk, as well as a number of special folders whose contents are either virtual or dynamically created. Recycle Bin, Libraries, Control Panel, This PC and Network are examples of such shell objects.



Windows shell replacement

This is a list of software that provides an alternative graphical user interface for Microsoft Windows operating systems. The technical term for this interface is a shell. Windows' standard user interface is the Windows shell; Windows 3.0 and Windows 3.1x have a different shell, called Program Manager. The programs in this list do not restyle the Windows shell, but replace it; therefore, they look and function differently, and have different configuration options.



Word processor

A word processor (WP) is a device or computer program that provides for input, editing, formatting, and output of text, often with some additional features.



Workstation

A workstation is a special computer designed for technical or scientific applications. Intended primarily to be used by a single user, they are commonly connected to a local area network and run multi-user operating systems. The term workstation has been used loosely to refer to everything from a mainframe computer terminal to a PC connected to a network, but the most common form refers to the class of hardware offered by several current and defunct companies such as Sun Microsystems, Silicon Graphics, Apollo Computer, DEC, HP, NeXT, and IBM which powered the 3D computer graphics revolution of the late 1990s. Workstations formerly offered higher performance than mainstream personal computers, especially in CPU, graphics, memory, and multitasking. Workstations are optimized for the visualization and manipulation of different types of complex data such as 3D mechanical design, engineering simulations like computational fluid dynamics, animation, medical imaging, image rendering, and mathematical plots. Typically, the form factor is that of a desktop computer, which consists of a high-resolution display, a keyboard, and a mouse at a minimum, but also offers multiple displays, graphics tablets, and 3D mice for manipulating objects and navigating scenes.

Workstations were the first segment of the computer market to present advanced accessories, and collaboration tools like videoconferencing. The increasing capabilities of mainstream PCs since the late 1990s have reduced distinction between the PCs and workstations. Typical 1980s workstations have expensive proprietary hardware and operating systems to categorically distinguish from standardized PCs.



World Wide Web

The World Wide Web (WWW), commonly known as the Web, is an information system enabling documents and other web resources to be accessed over the Internet. Documents and downloadable media are made available to the network through web servers and can be accessed by programs such as web browsers.

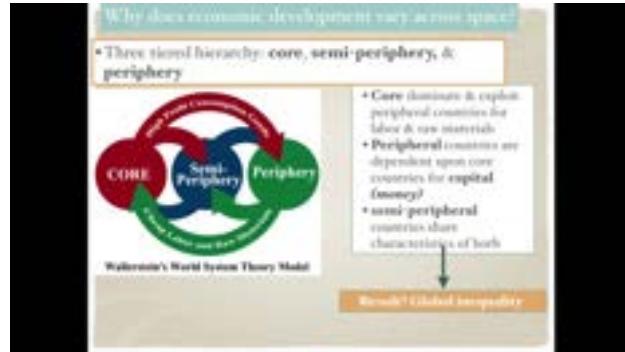
Servers and resources on the World Wide Web are identified and located through character strings called uniform resource locators (URLs). The original and still very common document type is a web page formatted in Hypertext Markup Language (HTML). This markup language supports plain text, images, embedded video and audio contents, and scripts (short programs) that implement complex user interaction. The HTML language also supports hyperlinks (embedded URLs) which provide immediate access to other web resources. Web navigation, or web surfing, is the common practice of following such hyperlinks across multiple websites. Web applications are web pages that function as application software. The information in the Web is transferred across the Internet using the Hypertext Transfer Protocol (HTTP).



World-systems theory

World-systems theory (also known as world-systems analysis or the world-systems perspective) is a multidisciplinary approach to world history and social change which emphasizes the world-system (and not nation states) as the primary (but not exclusive) unit of social analysis. "World-system" refers to the inter-regional and transnational division of labor, which divides the world into core countries, semi-periphery countries, and the periphery countries. Core countries focus on higher-skill, capital-intensive production, and the rest of the world focuses on low-skill, labor-intensive production and extraction of raw materials. This constantly reinforces the dominance of the core countries.

Nonetheless, the system has dynamic characteristics, in part as a result of revolutions in transport technology, and individual states can gain or lose their core (semi-periphery, periphery) status over time. This structure is unified by the division of labour. It is a world-economy rooted in a capitalist economy. For a time, certain countries become the world hegemon; during the last few centuries, as the world-system has extended geographically and intensified economically, this status has passed from the Netherlands, to the United Kingdom and (most recently) to the United States. Components of the world-systems analysis are longue durée by Fernand Braudel, "development of underdevelopment" by Gunder Frank, and the single-society assumption. Longue durée is the concept of the gradual change through the day-to-day activities by which social systems are continually reproduced. "Development of underdevelopment" described that the economic processes in the periphery are the opposite of the development in the core. Poorer countries are impoverished to enable a few countries to get richer.



Writing system

A writing system is a method of visually representing verbal communication, based on a script and a set of rules regulating its use. While both writing and speech are useful in conveying messages, writing differs in also being a reliable form of information storage and transfer. Writing systems require shared understanding between writers and readers of the meaning behind the sets of characters that make up a script. Writing is usually recorded onto a durable medium, such as paper or electronic storage, although non-durable methods may also be used, such as writing on a computer display, on a blackboard, in sand, or by skywriting. Reading a text can be accomplished purely in the mind as an internal process, or expressed orally.

Making a writing system:



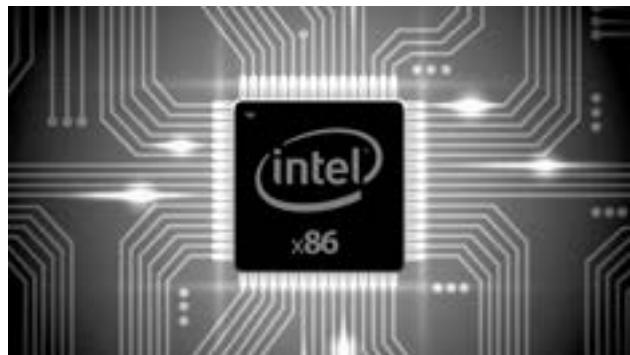
Now you can start making symbols!

X Window System

The X Window System (X11, or simply X) is a windowing system for bitmap displays, common on Unix-like operating systems.

X86

x86 (also known as 80x86 or the 8086 family) is a family of complex instruction set computer (CISC) instruction set architectures initially developed by Intel based on the Intel 8086 microprocessor and its 8088 variant. The 8086 was introduced in 1978 as a fully 16-bit extension of Intel's 8-bit 8080 microprocessor, with memory segmentation as a solution for addressing more memory than can be covered by a plain 16-bit address. The term "x86" came into being because the names of several successors to Intel's 8086 processor end in "86", including the 80186, 80286, 80386 and 80486 processors.



X86-64

x86-64 (also known as x64, x86_64, AMD64, and Intel 64) is a 64-bit version of the x86 instruction set, first released in 1999. It introduced two new modes of operation, 64-bit mode and compatibility mode, along with a new 4-level paging mode.



XTS-400

The XTS-400 is a multilevel secure computer operating system. It is multiuser and multitasking that uses multilevel scheduling in processing data and information. It works in networked environments and supports Gigabit Ethernet and both IPv4 and IPv6.



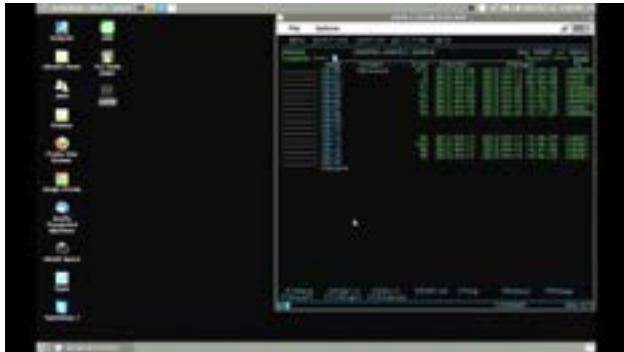
Z/Architecture

z/Architecture, initially and briefly called ESA Modal Extensions (ESAME), is IBM's 64-bit complex instruction set computer (CISC) instruction set architecture, implemented by its mainframe computers. IBM introduced its first z/Architecture-based system, the z900, in late 2000. Later z/Architecture systems include the IBM z800, z990, z890, System z9, System z10, zEnterprise 196, zEnterprise 114, zEC12, zBC12, z13, z14, z15 and z16.



Z/OS

z/OS is a 64-bit operating system for IBM z/Architecture mainframes, introduced by IBM in October 2000. It derives from and is the successor to OS/390, which in turn was preceded by a string of MVS versions. Like OS/390, z/OS combines a number of formerly separate, related products, some of which are still optional. z/OS has the attributes of modern operating systems, but also retains much of the older functionality originated in the 1960s and still in regular use?z/OS is designed for backward compatibility.



Z/VM

z/VM is the current version in IBM's VM family of virtual machine operating systems. z/VM was first released in October 2000 and remains in active use and development as of 2022. It is directly based on technology and concepts dating back to the 1960s, with IBM's CP/CMS on the IBM System/360-67 (see article History of CP/CMS for historical details). z/VM runs on IBM's IBM Z family of computers. It can be used to support large numbers (thousands) of Linux virtual machines. (See Linux on IBM Z.)

