- Introduction (history)
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An operating system (OS) is system software that

- manages computer hardware and software resources,
- provides common services for computer programs.

All computer programs (excluding firmware) require an OS to function.

Reference:

https://en.wikipedia.org/wiki/Operating_system

User

 ↑
 Application

 ↑
 Operating System

 ↑
Hardware

Reference:

• https://goo.gl/soMFop (OS common features)

- Kernel
- Networking
- Security
- User interface (shell)

The kernel is a computer program that is the core of a computer's operating system, with complete control over everything in the system.

- monolithic kernel (speed)
- microkernel (modularity)
- hybrid kernels
- nanokernel ≅ picokernel
- exokernel

- Unix and Unix-like OSes
- BSD and its descendants
- macOS
- Linux
- Microsoft Windows
- Other

Reference:

• https://goo.gl/3Q9fQk (Examples of OSes)

- 1950s: basic OS features (monitoring)
- 1960s: modern and more complex features
 - runtime libraries
 - interrupts
 - parallel processing
- 1980s: personal computers

Reference:

- https://en.wikipedia.org/wiki/Operating_system#History
- https://en.wikipedia.org/wiki/Timeline_of_operating_systems
- https://en.wikipedia.org/wiki/History of operating systems

Some Unix and Unix-like operating systems

- 1964: Multics (novel and valuable ideas)
- 1969: Ken Thompson (Space Travel, PDP-7)
- 1970: Unics (+ Dennis Ritchie & Brian Kernighan)
- 1971: Unix philosophy
- 1972: Unix is rewritten in C (portability)
- 1983: GNU Project (Richard Stallman)
- 1987: Minix (Andrew S. Tanenbaum)
- 1991: Linux (Linus Torvalds, v0.01, 10,239 LoC)
- 1992: GNU/Linux (released under GNU GPLv2)
- 1994: GNU/Linux (v1.0.0, 176,250 LoC)
- 2017: GNU/Linux (v4.13) [4.12 = 24,170,860 LoC]

References:

- https://en.wikipedia.org/wiki/Multics
- https://en.wikipedia.org/wiki/Unix
- https://goo.gl/x6N9dU (Unix history)
- http://simh.trailing-edge.com/photos.html
- https://www.bell-labs.com/usr/dmr/www/1stEdman.html

"minimalist, modular software development"
"simple, short, clear, modular, and extensible code"

Write programs

- that do one thing and do it well,
- to work together,
- to handle text streams (universal interface).
 Peter H. Salus, 1994

Unix is simple.
It just takes a genius to understand its simplicity.
Dennis Ritchie

③

Reference:

https://en.wikipedia.org/wiki/Unix_philosophy

Some Unix and Unix-like operating systems

- 1964: Multics (novel and valuable ideas)
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- 1987: Minix (Andrew S. Tanenbaum)
- 1991: Linux (Linus Torvalds, v0.01, 10,239 LoC) [listen the pronunciations]
- 1992: GNU/Linux (released under GNU GPLv2)
- 1994: GNU/Linux (v1.0.0, 176,250 LoC)
- 2017: GNU/Linux (v4.13) [4.12 = 24,170,860 LoC]

LoC ≝ lines of code

References:

- https://en.wikipedia.org/wiki/GNU_Project
- https://en.wikipedia.org/wiki/MINIX
- https://en.wikipedia.org/wiki/Linux kernel
- ftp://ftp.funet.fi/pub/Linux/PEOPLE/Linus/SillySounds/

The Linux kernel is a monolithic kernel, supporting

- true preemptive multitasking,
- virtual memory,
- shared libraries,
- demand loading,
- shared copy-on-write executables,
- memory management,
- the Internet protocol suite and
- threading.

Reference:

https://en.wikipedia.org/wiki/Linux_kernel

- Kernel
- Networking
- Security
- User interface (shell)

In computing, a shell is a user interface for interacting with an OS.

- CLI
- TUI
- GUI

[demo]

It is named a shell because it is a layer around the operating system kernel.

- 1964: Multics RUNCOM (Louis Pouzin) (executing command scripts)
- 1965: Multics shell (Glenda Schroeder) (ordinary user code)
- 1971: Thompson shell [sh] (Ken Thompson) (simple command interpreter)
- 1975: PWB (Mashey) shell [sh] (John Mashey) (programming)
- 1977: Bourne shell [sh] (Stephen Bourne) (scripting)
- 1978: C shell [csh] (Bill Joy) (more interactive, C-like)
- 1983: TENEX C shell [tcsh] (Ken Greer) (backward compatible with the C shell)
- 1983: Korn shell [ksh] (David Korn) (between the Bourne shell and the C shell)
- 1989: Almquist shell [ash] (Kenneth Almquist, BSD) (lightweight Bourne shell clone)
- 1989: Bourne-again shell [bash] (Brian Fox, GNU)
 free shell that could run existing shell scripts
- 1990: Z shell [zsh] (Paul Falstad) (extended Bourne shell, Oh My Zsh)
- 1997: Debian Almquist shell [dash] (Herbert Xu, Debian)

Reference:

- https://en.wikipedia.org/wiki/Command-line interface#History
- https://en.wikipedia.org/wiki/Unix shell
- https://en.wikipedia.org/wiki/Comparison_of_command_shells

Nobody really knows what the Bourne shell's grammar is. Even examination of the source code is little help. Tom Duff (rc shell, Version 10 Unix and Plan 9)

☺

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__._..__ _\(_| ||_) | |

make typescript of terminal session
hardcopy record of an interactive session

[demo]

-t, --timing
Output timing data to standard error,
 or to file when given.

[demo]
see scriptreplay, too

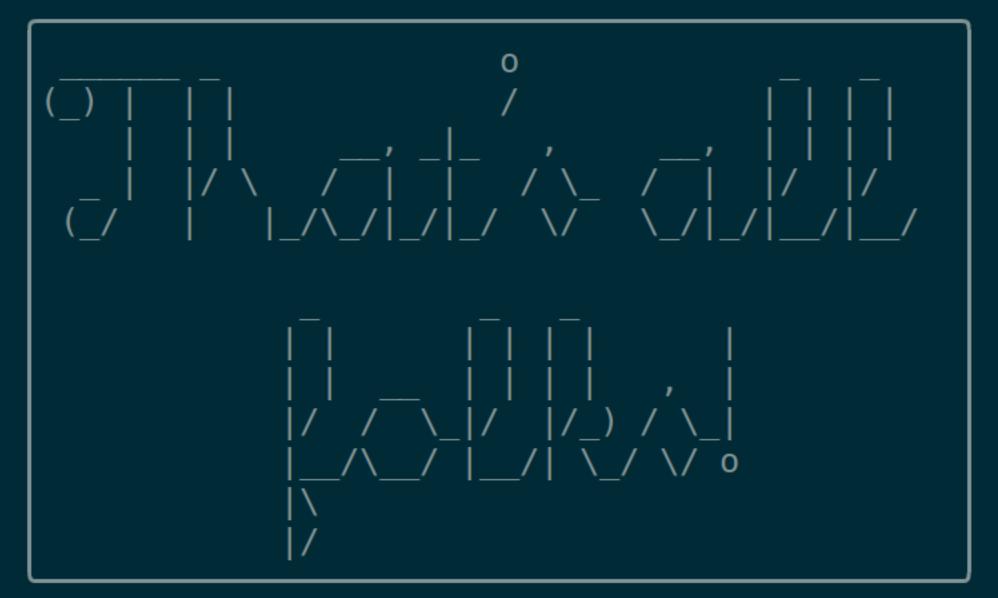
-f, --flush
 Flush output after each write.
 Useful for telecooperation.

[demo]

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When to use and not to use shell scripts?

- low barrier of entry
- usability
- task automation
- speed
- low level operations
- dependencies
- data types
- debugging
- security



-_(ツ)_/-