

GNU/Linux concepts

Операционни системи, ФМИ, 2021/2022

UNIX

- multitasking, multi-user computer operating system
- originally developed in 1969 by a group of AT&T employees at Bell Labs
 - Brian Kernighan
 - Dennis Ritchie
 - Ken Thompson
- by 1973 had been almost entirely recoded in C
 - previously assembler was used
 - portable

UNIX design principles

- everything is a file
- small single-purpose programs with the ability to pipe them together
- configuration in ASCII
- *Mike Gancarz. The UNIX Philosophy. Digital Press, 1994*

Standard streams

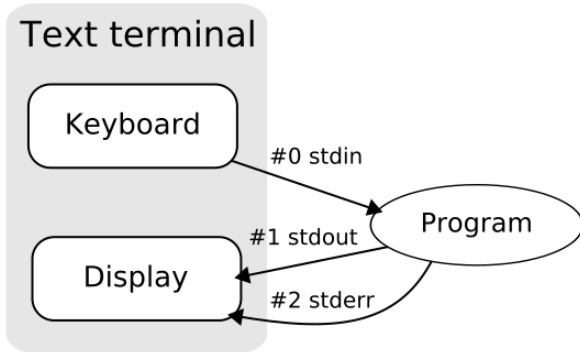
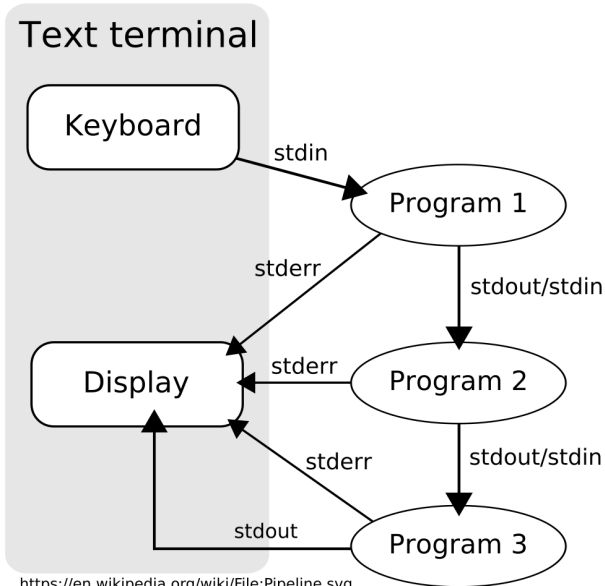


Figure 1: streams

Pipeline



Richard Stallman, GNU, FSF, GPL

- GNU (GNU's Not Unix), 1983 – gcc, gdb, emacs
- Free Software Foundation, 1985
- GNU General Public License (GPL)
 - Guarantees that free software remains free
 - All software under the GPL make source available to the end user
 - Changes to a GPL'd software package must also be licensed under the GPL
 - Source code from one GPL'd software package can be incorporated into other GPL'd software
- “Free as in Freedom: Richard Stallman's Crusade for Free Software”, Sam Williams, March 2002
 - <http://oreilly.com/openbook/freedom/>

Linux kernel

- Linus Torvalds
- Minix
- The Linux kernel
 - re-implementation of the UNIX APIs
 - GPL license
- GNU/Linux
- GNU/Hurd
- GNU/kFreeBSD

GNU/Linux distribution

- Linux kernel
- GNU software
- BSD/Linux utilities
- X.Org
- GUI components
- packaging and support
- added features

Standards

- Portable Operating System Interface for Unix (POSIX), IEEE
- Single UNIX Specification
- Filesystem Hierarchy Standard (FHS)
 - <https://refspecs.linuxfoundation.org/fhs.shtml>
- Linux Standards Base (LSB)

Popular distributions

- GNU/Linux Distribution Timeline
 - <http://futurist.se/gldt/>
 - <https://github.com/FabioLolix/linuxtimeline>
 - Slackware
 - Debian
 - Ubuntu
 - Linux Mint
 - Red Hat Enterprise Linux (RHEL)
 - Fedora
 - CentOS (Community ENTERprise Operating System)
 - Arch Linux
- Non-Linux examples
 - FreeBSD, OpenBSD, NetBSD

Login

- terminals
 - serial
 - virtual (TTY, PTY, PuTTY)
- GUI
- network login
- shell
 - built-in commands type `pwd`
 - external commands type `passwd`

Login session info

- User ID (UID)
- Group ID (GID)
- privileged user – root, UID 0
- whoami
- id
- tty

Switching user

- su – change user ID (or become superuser)
 - su -, su -l, su --login – provide environment
- sudo – execute a command as another user

Help

- external commands
 - `foo --help, foo -h`
 - `man [section] foo`
 - ① Executable programs or shell commands
 - ② System calls (functions provided by the kernel)
 - ③ Library calls (functions within program libraries)
 - ④ Special files (usually found in `/dev`)
 - ⑤ File formats and conventions eg `/etc/passwd`
 - ⑥ Games
 - ⑦ Miscellaneous
 - ⑧ System administration commands (usually only for root)
 - ⑨ Kernel routines [Non standard]
 - search through man pages for matches
 - `whatis (man -f)` - manual page descriptions
 - `apropos (man -k)` - search the manpage names and descriptions
 - `info`
- built-in commands `help` `pwd`