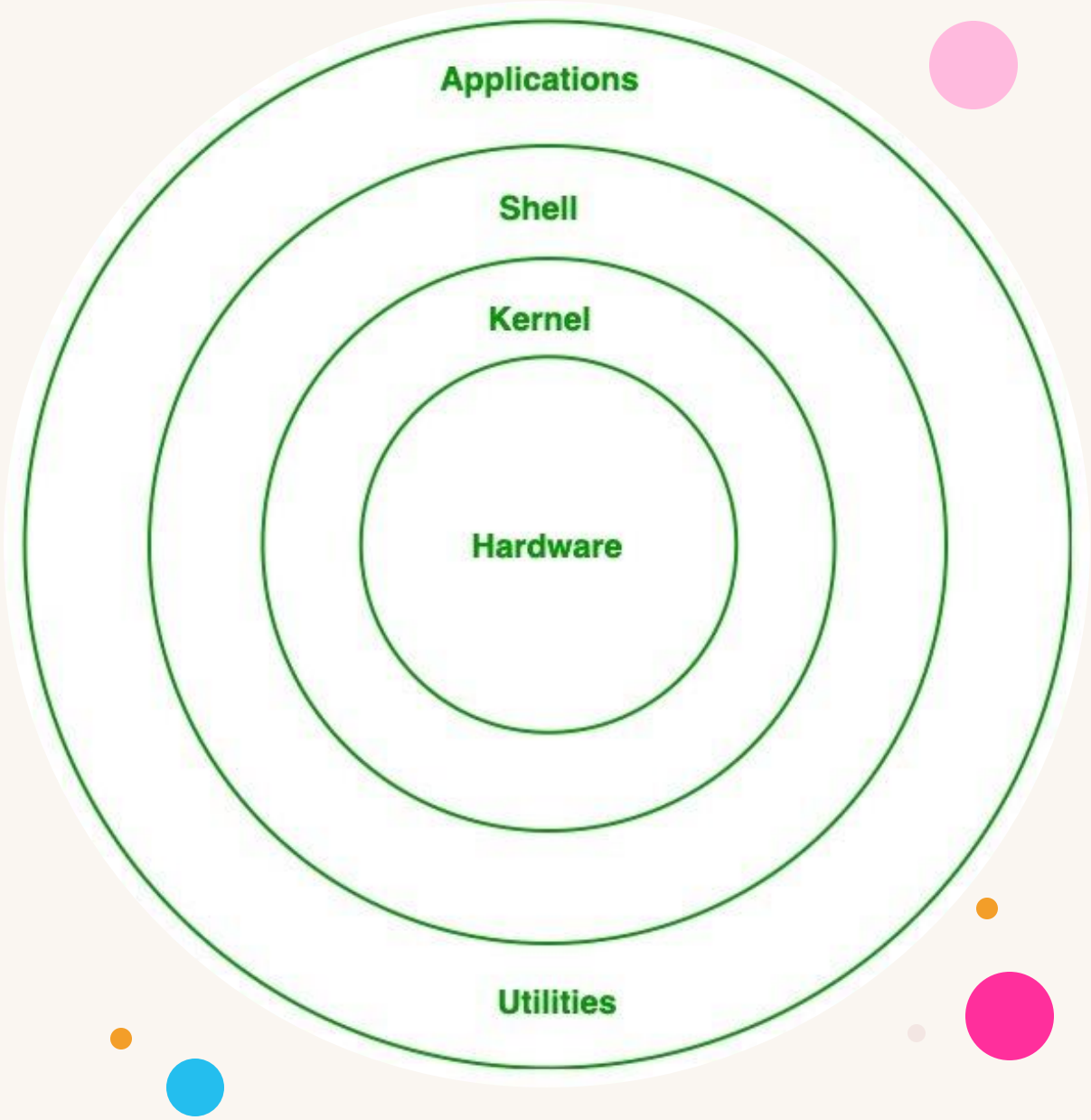
What is Linux? History and Evolution

Linux is a free, open-source operating system kernel created by Linus Torvalds in 1991. It forms the backbone of many operating systems like Ubuntu, Red Hat, and CentOS. Linux is widely used in servers, desktops, mobile devices, and embedded systems.



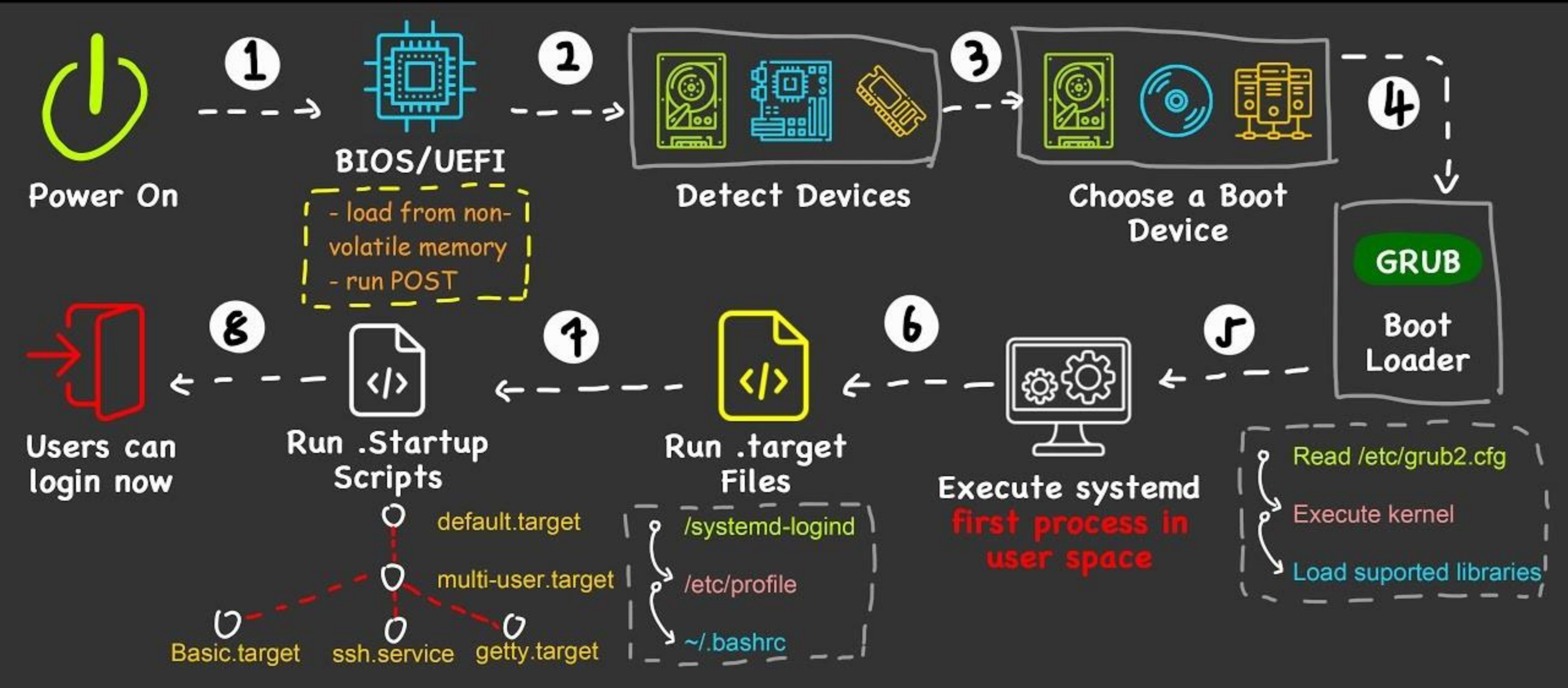
Open-Source Concept and Licensing

Linux is distributed under the GNU General Public License (GPL), which ensures freedom to use, modify, and distribute the software.

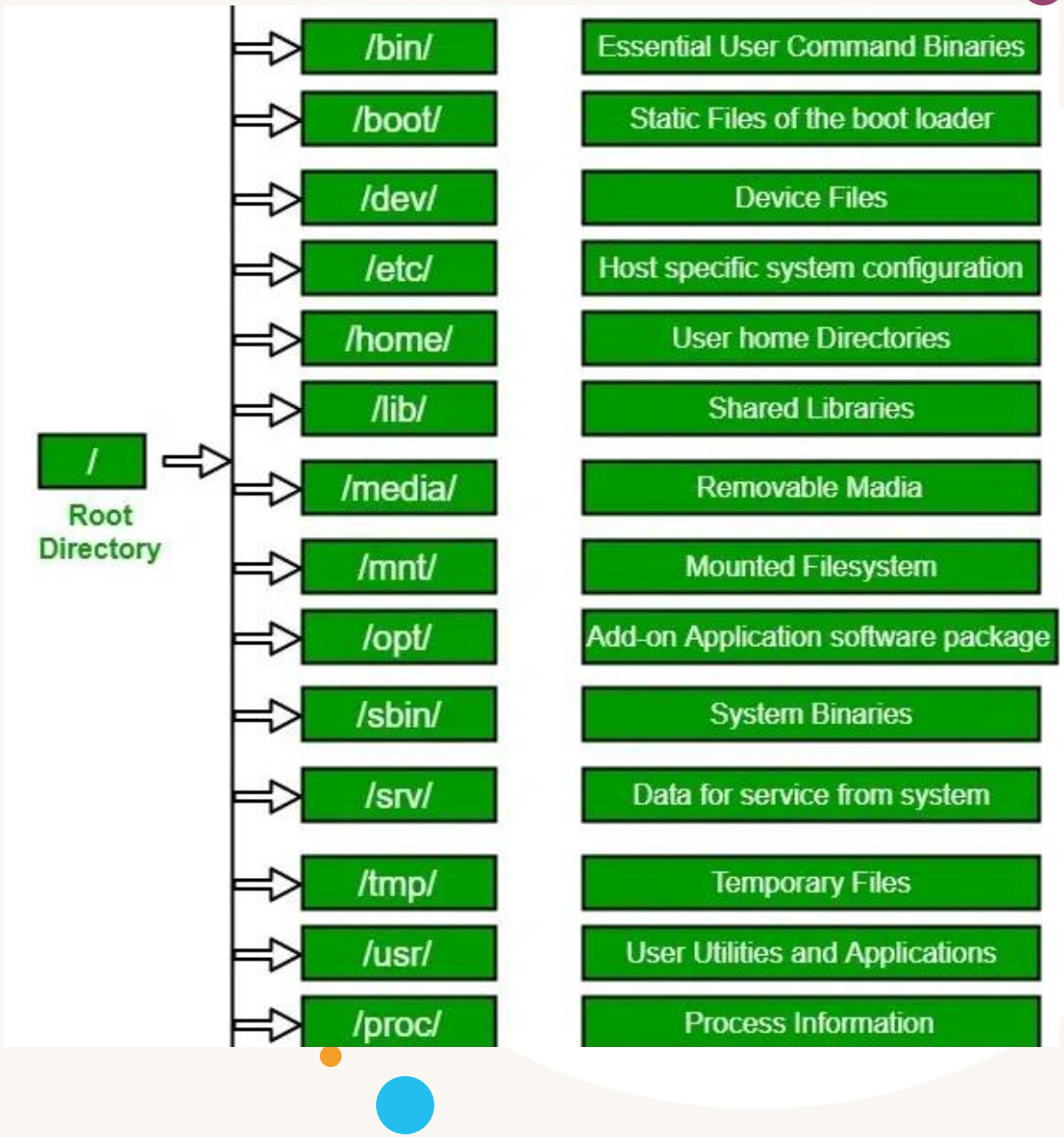
The term "**open source**" refers to computer software or applications where the owners or copyright holders enable the users or third parties to use, see, and edit the product's source code. The source code of an open-source OS is publicly visible and editable.

- Advantages (Cost Effective, Flexibility)
- Disadvantages(Complicated, No Support)

Linux Boot Process Explained



Linux File Hierarchy Structure



/ (Root):

Primary hierarchy root and root directory of the entire file system hierarchy.

- Every single file and directory start from the root directory.
- The only root user has the right to write under this directory.
- /root is the root user's home directory, which is not the same as /

/bin :

Essential command binaries that need to be available in single-user mode; for all users, e.g., cat, ls, cp.

- Contains binary executables.
- Common Linux commands you need to use in single-user modes are located under this directory.
- Commands used by all the users of the system are located here e.g. ps, ls, ping, grep, cp

/boot :

Boot loader files, e.g., kernels, initrd.

- Kernel initrd, vmlinux, grub files are located under /boot
  - Example: initrd.img-2.6.32-24-generic, vmlinuz-2.6.32-24-generic

/dev :

Essential device files, e.g., /dev/null.

- These include terminal devices, usb, or any device attached to the system.
  - Example: /dev/dba, /dev/tty1, /dev/usbmon0

/etc :

Host-specific system-wide configuration files.

- Contains configuration files required by all programs.
- This also contains startup and shutdown shell scripts used to start/stop individual programs.
  - Example: /etc/resolv.conf, /etc/logrotate.conf

/home :

Users' home directories, containing saved files, personal settings, etc.

- Home directories for all users to store their personal files.
  - Example: /home/umer, /home/abid

/lib:

Libraries essential for the binaries in /bin/ and /sbin/.

/media:

Mount points for removable media such as CD-ROMs (appeared in FHS-2.3).

- Temporary mount directory for removable devices.
  - Examples: /media/cdrom for CD-ROM

/mnt :

Temporarily mounted filesystems.

- Temporary mount directory where sysadmins can mount filesystems.

/opt :

Optional application software packages.

- Contains add-on applications from individual vendors.
- Add-on applications should be installed under either /opt/ or /opt/ sub-directory.
  - Examples: Anti-viruses, Security Tools, Applications Agents

/sbin :

Essential system binaries, e.g., fsck, init, route.

- Just like /bin, /sbin also contains binary executables.
- The linux commands located under this directory are used typically by system administrators, for system maintenance purposes.

/tmp :

Temporary files. Often not preserved between system reboots and may be severely size restricted.

- Directory that contains temporary files created by system and users.
- Files under this directory are deleted when the system is rebooted.
- Data stored in certain locations or file systems is **ephemeral**, meaning it exists only during the current session of the operating system.

/usr :

Secondary hierarchy for read-only user data; contains the majority of (multi-)user utilities and applications.

- /usr/bin contains binary files for user programs.
- /usr/sbin contains binary files for system administrators.
- /usr/local contains user's programs that you install from source.
- /usr/src holds the Linux kernel sources, header-files and documentation

/proc:

Virtual filesystem providing process and kernel information as files. In Linux, it corresponds to a procs mount. Generally, automatically generated and populated by the system, on the fly.

/run :

The /run directory in Linux is a part of the Filesystem Hierarchy Standard (FHS) version 3.0, introduced as a standardized location for volatile runtime data. This directory is critical for storing data that needs to exist only while the system is running and should not persist across reboots.

Before /run, Linux systems used /var/run for similar purposes. With FHS 3.0:

Feature	/run	/var/run
Location	Root-level directory (/run)	Subdirectory of /var
Mounting	Mounted early as tmpfs	Stored on disk; requires /var to be mounted
Volatility	Contents cleared on every reboot	May persist stale files across reboots