Packages & Software Management (Core)

Linux Commands Course · Section 13

What Are Packages?

A package is a compressed bundle that contains:

- Program files (binaries, libraries, icons)
- Configuration files
- Metadata (version, dependencies, maintainer info)

Instead of manually copying files, the **package manager** handles installation, updates, and removal automatically.

Where Packages Come From — Repositories

Linux distributions host packages on remote repositories (repos) — organized servers containing signed software.

Each system has a list of repositories stored in config files, such as:

- /etc/apt/sources.list (Debian/Ubuntu)
- /etc/yum.repos.d/ (RHEL/Fedora)
- /etc/pacman.conf (Arch)
- /etc/zypp/repos.d/ (openSUSE)

The package manager connects to these servers to download and verify packages.

APT (Advanced Package Tool) — Debian/Ubuntu

APT is the package manager used by **Debian**, **Ubuntu**, and their derivatives (Mint, Kali, etc.).

Updating Package Information

Before installing anything, update your local list of available software:

sudo apt update

This syncs your system with the repository metadata $-\ \mathsf{names}\ \mathsf{,}\ \mathsf{versions}\ \mathsf{,}\ \mathsf{and}\ \mathsf{dependencies}\ \mathsf{.}$

Then upgrade installed software:

sudo apt upgrade

- apt update → refreshes the list
- apt upgrade → installs newer versions of already-installed packages

To upgrade all packages and remove obsolete ones:

sudo apt full-upgrade

Installing Packages

Install one or multiple packages:

sudo apt install curl vim git

APT automatically downloads dependencies and installs them.

Install a specific version:

sudo apt install nginx=1.18.0-0ubuntu1

Removing Packages

Remove a package but keep its config files:

sudo apt remove nginx

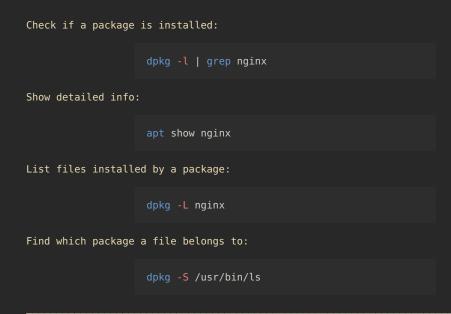
Remove a package and its configs:

sudo apt purge nginx

Clean up unnecessary packages and cache:

sudo apt autoremove
sudo apt clean

Inspecting Packages



Installing Local .deb Files - dpkg

Install a .deb file manually (downloaded from a website):

sudo dpkg -i package.deb

If dependencies are missing, fix them with:

sudo apt -f install

This tells APT to install the required packages automatically.

RHEL/Fedora - dnf and rpm

```
dnf (successor to yum) is used on RHEL, Fedora, and CentOS.
Install software:
                        sudo dnf install nginx
Remove software:
                        sudo dnf remove nginx
Update all packages:
                        sudo dnf update
Query package info:
                        dnf info nginx
Manual package management via RPM:
                        sudo rpm -qi nginx  # info
sudo rpm -ql nginx  # list files
sudo rpm -ivh file.rpm  # install
                        sudo rpm -e package # remove
```

Arch Linux - pacman

The package manager uses .pkg.tar.zst packages from Arch repositories. Update repository and system in one command: sudo pacman -Syu Install a package: sudo pacman -S firefox Remove a package: sudo pacman -R firefox Search for packages: pacman -Ss python View info: pacman -Qi firefox

openSUSE - zypper

zypper is the package tool for openSUSE and SLE systems. Refresh repositories: sudo zypper refresh Install packages: sudo zypper in vim Remove packages: sudo zypper rm vim Update system: sudo zypper up Show package info:

Universal Package Systems

Some distributions support universal formats — portable across distros. Snap Developed by Canonical, runs sandboxed applications. List installed snaps: snap list Install a snap package: sudo snap install code --classic Remove a snap: sudo snap remove code Flatpak Another universal, sandboxed format. Install a Flatpak application: flatpak install flathub org.gimp.GIMP Run a Flatpak app: flatpak run org.gimp.GIMP List installed Flatpaks:

Comparing Package Managers

Distro	Tool	Install Example	Notes
Debian/Ubuntu	apt	apt install nginx	Most common; uses .deb Uses .rpm Very fast, rolling updates Enterprise-grade Great for desktop software
RHEL/Fedora	dnf	dnf install nginx	
Arch	pacman	pacman -S nginx	
openSUSE	zypper	zypper in nginx	
Universal	snap, flatpak	Cross-platform apps	

Recap

- APT update, install, remove, purge, inspect packages
- Repositories centralized sources of verified software
- dpkg for manual .deb installs
- dnf / rpm, pacman, zypper alternatives for other distros
 snap / flatpak universal sandboxed packages

Mastering package management makes system maintenance fast, secure, and reliable.