Packages & Software Management (Core)

Linux Commands Course · Section 13

IDSchool

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 — names, versions, and dependencies.

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

Check if a package is installed:

```
dpkg -l | grep nginx
```

Show detailed info:

```
apt show nginx
```

List files installed by a package:

```
dpkg -L nginx
```

Find which package a file belongs to:

```
dpkg -S /usr/bin/ls
```

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:

Arch Linux – pacman

The **pacman** 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:

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:

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
```

Comparing Package Managers

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

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.
