Linux Package Management

Kiran

Table of Contents

Linux Package Management

What is a Package?

A Package is a piece of software that can be installed on an *nix-like Operating system.

There are various ways to install packages in GNU/Linux distributions.

Each family of Linux Operating systems (such as Debian, Fedora/Redhat, Slackware) has a different mechanism for installing and managing packages.

Some examples of software packages:

- firefox
- git
- vim
- tree
- disk utilities

Family	Package
Debian	dpkg, apt-get, apt
Redhat	rpm, dnf, yum
Slackware	pkgtools, slackpkg
Alpine	apk

Some popular distributions or Operating systems of Debian and Redhat Families

Debian	Latest Version	Redhat	Latest Version
Debian	10 (buster)	Redhat Enterprise Linux	8.4
Ubuntu	21.04	Amazon Linux	same as RHEL
Linux Mint	20.1	CentOS	8.4
Kali Linux	2021.2	Fedora	32

Note: The versions are as of 1st June 2021.

There are three main ways of installing a package:

1. From Software Repositories
2. Downloading the binary (executable)
3. Compiling(build) and installing

What are Repositories?

A repository or repo for short is a central storage location where your distribution maintainer keeps list of commonly used software packages.

Repos for short) are basically a place where verified packages are stored for easy retrieval and installation.

They can be online like the YUM repository or they can be on a local folder or a DVD where you have a special collection of software that you need.

Several repositories are available from which you can download and install these packages.

There are 2 types of repos:

- Official repos of your particular distro - maintained by the distribution owner or maintainer. For instance, Canonical maintains the repos for Ubuntu. Redhat for rhel
- 3rd party repos - maintained by individual software owners. For instance, Docker maintains it's own repos to distribute docker software, so does Ansible.

How does my linux os know where to download packages from?

Each distribution has the list of repositories - the locations from where to fetch the packages. The information is stored in *etc* folder.

In Debian based OS the repos/sources are listed in `/etc/apt/sources.list` and additional repos are found under various files in the directory `/etc/apt/sources.list.d`.

In RedHat based OS the repos are found under the directory `/etc/yum`

Debian Package Management.

APT

Advanced Packaging Tool is the default Pakcage Manager in the Debian Family of distributions.

APT simplifies the installation of packages by automating the downloading and installation of a software package.

Common APT Commands:

- Synchronize the indexes with your distribution. In other words update the metadata of all the packages in the repositories.

```
sudo apt-get update
```

- Upgrade all the installed packages

```
sudo apt-get upgrade
```

- Install a Package

```
sudo apt-get install <packageName>
```

  Example: Install git

```
sudo apt-get install git
```

- Remove/Uninstall a package

```
sudo apt-get remove <packageName>
```

  Example: Uninstall git

```
sudo apt-get remove git
```

- Search for packages in the existing repos. This is useful when you're not aware of the exact name of the package.

```
sudo apt-cache search <searchstring>
```

  Example: To search for the existing packages for `openjdk`.

```
sudo apt-cache search openjdk
```

  The result looks like the below

```
crypto-policies - unify the crypto policies used by different
applications and libraries
libeclipse-collections-java - Eclipse Collections - comprehensive
collections library for Java
libhsdis0-fcml - HotSpot disassembler plugin using FCML
default-jdk - Standard Java or Java compatible Development Kit
default-jdk-doc - Standard Java or Java compatible Development Kit
(documentation)
default-jdk-headless - Standard Java or Java compatible Development Kit
(headless)
default-jre - Standard Java or Java compatible Runtime
default-jre-headless - Standard Java or Java compatible Runtime
(headless)
libjax-maven-plugin - Using the xjc goal with OpenJDK 11+
jtreg - Regression Test Harness for the OpenJDK platform
libreoffice - office productivity suite (metapackage)
openjdk-11-dbg - Java runtime based on OpenJDK (debugging symbols)
openjdk-11-demo - Java runtime based on OpenJDK (demos and examples)
openjdk-11-doc - OpenJDK Development Kit (JDK) documentation
openjdk-11-jdk - OpenJDK Development Kit (JDK)
openjdk-11-jdk-headless - OpenJDK Development Kit (JDK) (headless)
openjdk-11-jre - OpenJDK Java runtime, using Hotspot JIT
openjdk-11-jre-headless - OpenJDK Java runtime, using Hotspot JIT
```

```
(headless)
openjdk-11-jre-zero - Alternative JVM for OpenJDK, using Zero
openjdk-11-source - OpenJDK Development Kit (JDK) source files
openjdk-11-jre-dcevm - Alternative VM for OpenJDK 11 with enhanced class
redefinition
```

- Remove package and all it's configuration (Clean Uninstall)

```
sudo apt-get purge <packageName>
```

- Remove dependencies or packages that are no longer needed.

```
sudo apt-get auto-remove
```

You could replace `apt-get` with `apt` in all the above commands and it works the same way. `apt` may not work on older versions.

dpkg

`dpkg` is low-level utility that is used to install debian binaries (`.deb`). It has many advanced functions.

- Lists the packages installed on the current system.

```
sudo dpkg --list
```

Get the list of installed packages

```
sudo dpkg --get-selections
```

If a package is not available through the repositories, the binary can be downloaded and installed using dpkg command The binaries for the Debian packages `.deb` extension

```
sudo dpkg -i <package>
```

Example:

To install `openjdk-17-jdk-headless` on Debian Family of Operating systems:

Download the debian binary file from here.

Once the `openjdk-17-jdk-headless_17~19-1_amd64.deb` file is downloaded, run the below command

```
sudo dpkg -i openjdk-17-jdk-headless_17~19-1_amd64.deb
```

Note: Packages installed directly by downloading are not automatically updated with `apt-upgrade` as it's not tracked by `apt`. Only in exceptional cases, softwares are installed directly. General practice is to install packages with `apt-get`.

Redhat Package Management

Redhat family of operating systems uses rpm as the backend and yum as the frontend for package manangent.

Installing a package:

- rpm - Redhat Package Manager
- yum - Yellowdog Update Manager.

Common yum Commands:

Update all the packages to the latest version.

```
sudo yum update
sudo yum upgrade
```

`yum update` and `yum upgrade` do the same thing but with `yum upgrade` all the unwanted packages would be deleted once the packages are upgraded.

Note: `yum update` is different from `apt-get update`. `yum update` is almost equivalent to `apt-get upgrade`.

Install a Package

```
sudo yum install <packageName>
```

Example: Install git

```
sudo yum install git
```

Remove/Uninstall a package

```
sudo yum remove <packageName>
```

Example: Uninstall git

```
sudo yum remove git
```

rpm - RedHat Pakckage Manager

`rpm` is the low level utility to manage packages in Redhat operating systems (Centos, Amazon Linux, Oracle Linux, Fedora, RHEL etc)

Lists all the installed packages

```
sudo rpm -qa
```

Gives details about a package

```
sudo rpm -q <packagename>
```

When a package is not available through the existing repositories, the binary file can be downloaded from the Internet and installed with `rpm` command

Redhat packages typically have the extension of `.rpm`

```
sudo rpm -i <packagename>
```

Example:

To install java openjdk on Redhat family of Operating Systems:

Download the rpm from here using `curl` or `wget`.

Once the `java-1.8.0-openjdk-1.8.0.262.b10-1.el7.x86_64.rpm` file is downloaded, then run the below command

```
sudo rpm -i java-1.8.0-openjdk-1.8.0.262.b10-1.el7.x86_64.rpm
```

Note: Packages installed directly by downloading are not automatically updated with `yum update` or `yum upgrade` as it's not tracked by `yum`.Only in exception cases, softwares are installed directly.

Conclusion

There are different package managers adopted by serveral Linux distributions or Operating systems. Ubuntu, like all Debian based systems, use `apt-get` or `apt` to install packages and `dpkg` is the low end