

System Administration (2)

IT401

Prepared by
Dr. Ahmed El-Douh

Lecture 10



System Administration 2

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Installing and updating software packages

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Objectives

Upon completion of this lecture, you will be able to:

- Understand software package management in RHEL using RPM, YUM, and DNF.
- Install, update, and manage individual packages and package groups.
- Search and manage repositories and package information using YUM.
- Configure and validate a local RHEL ISO repository for offline updates.

Outlines

- ❑ Installing and updating software packages
 - What is a Package?
 - Install vs Upgrade Packages
 - Installing a package from a remote location
 - Searching for software packages
 - Updating software packages



Installing and updating software packages



Installing and updating software packages

What is a **Package**?

- In RHEL and CentOS, software is organized and distributed using packages.
- A **package** is a compressed archive that contains all files related to a specific software.
- It includes binaries, libraries, metadata, and installation instructions.
- **Packages** also define software dependencies required for correct operation.
- RHEL and CentOS use the **RPM** package format developed by Red Hat.

Installing and updating software packages

RPM: The Red Hat Package Manager and yum

- To ease the management of rpm packages, the **rpm package manager** was created.
- Although very powerful, it is focused on single packages, so it is not able to resolve dependencies.
- To manage the relationships between packages, and avoid the infamous dependency hell, first **yum** package manager (Yellow Updater Modified) and then its evolution.

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Installing a package with rpm

- One of the most basic operations we can perform with rpm is the installation of a package.
- As said before, this will work only if the package has no external dependencies, since rpm is not able to manage it.
- There are basically three ways we can install a package with rpm: they correspond respectively to the **-i**, **-U** and **-F** options.
- To install a new package, we can run rpm with the **-i** option (short for **--install**).

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- The syntax is very simple:

```
rpm -i packagename.rpm
```

- When we run the command above, the specified package is installed only if not already installed on the system. If we try to install an already installed package (gedit in this case), we receive an error:

```
rpm -i gedit-3.28.1-3.el8.x86_64.rpm  
package gedit-2:3.28.1-3.el8.x86_64 is already installed
```



Install vs Upgrade Packages



Installing and updating software packages

❖ Install vs Upgrade Packages

- The term same **package** means the same exact version.
- **Installing** a new package version keeps the older versions installed.
- This method is recommended when installing a new kernel.
- Multiple kernel versions can coexist to provide a fallback option.
- Using the -U option performs an upgrade operation.
- If the package is not installed, it will be installed.
- If an older version exists, it will be replaced by the newer one.
- After upgrading, older package versions are removed.

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Upgrade Warnings and Freshen Option

- Upgrading critical software like the kernel in place is discouraged.
- Older kernel versions should be kept until the new one is fully tested.
- Removing old kernels too early can cause system instability.
- The **-F** option is short for freshen.
- The freshen option updates only existing packages.
- **Packages** that do not already exist on the system are not installed.

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Installing a package from a remote location

- ❑ With **rpm** is also possible to install a package which is not on our local filesystem.
- ❑ Say for example we want to install a package accessible via the ftp protocol; the command to run would be the following:

```
rpm -i ftp://ftp.someaddress.com/package.rpm
```

- ❑ It is also possible to provide a username and a password if authentication is required, including such information in the address:

```
rpm -i ftp://username:password@ftp.someaddress.com/package.rpm
```

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Application Streams

- RHEL 8 introduces the concept of Application Streams.
- Multiple versions of user-space applications are delivered separately from the core OS.
- Application Streams are updated more frequently than core system packages.
- This approach provides greater flexibility without affecting system stability.
- Application Stream components can be delivered as modules or RPM packages.
- Application Streams are provided through the AppStream repository in RHEL 8.
- Each Application Stream has its own life cycle, which may be shorter than RHEL 8.

Installing and updating software packages

❖ Modules and Module Streams

- A **module** is a collection of related packages forming a logical unit.
- A module can represent an application, language stack, database, or tools set.
- All packages in a module are built, tested, and released together.
- Module streams represent different versions of the same module.
- **Example:** PostgreSQL module provides multiple streams such as PostgreSQL 10 and PostgreSQL 9.6.
 - Only one module stream can be installed on a system at a time.
 - Different module versions can run in separate containers.

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Searching for software packages

❑ **yum** allows you to perform a complete set of operations with software packages.

The following section describes how to use **yum** to:

1. Search for packages.
2. List packages.
3. List repositories.
4. Display information about the packages.
5. List package groups.
6. Specify global expressions in yum input.

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1. Searching packages with YUM:

- ❑ Use the following procedure to find a package providing a particular application or other content.

➤ Procedure

- To search for a package, use:

```
# yum search term
```

- ❑ Replace *term* with a term related to the package.

❖ **Note that** `yum search command` returns term matches within the name and summary of the packages.

This makes the search faster and enables you to search for packages you do not know the name of, but for which you know a related term.

- ❑ To include term matches within package descriptions, use:

```
# yum search --all term
```

- ❑ Replace *term* with a term you want to search for in a package name, summary, or description.

❖ **Note that** `yum search --all` enables a more exhaustive but slower search.

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2. Listing packages with YUM

- ❑ Use the following procedure to list installed and available packages.

➤ Procedure

- ❑ To list information on all installed and available packages, use: `# yum list --all`
- ❑ To list all packages installed on your system, use: `# yum list --installed`
- ❑ To list all packages in all enabled repositories that are available to install, use: `# yum list --available`

Installing and updating software packages

3. Listing repositories with YUM:

❑ Use the following procedure to list enabled and disabled repositories.

➤ Procedure

- ❑ To list all enabled repositories on your system, use: `# yum repolist`
- ❑ To list all disabled repositories on your system, use: `# yum repolist --disabled`
- ❑ To list both enabled and disabled repositories, use: `# yum repolist --all`

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4. Displaying package information with YUM

- ❑ You can display various types of information about a package using YUM, for example version, release, size, loaded plugins, and more.'

➤ Procedure

- To display information about one or more packages, use:

```
# yum info package-name
```

- Replace *package-name* with the name of the package.

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5. Listing package groups with YUM

- ❑ Use yum to view installed package groups and filter the listing results.

➤ Procedure

- To view the number of installed and available groups, use: `# yum group summary`
- To list all installed and available groups, use: `# yum group list`
- ❖ **Note that** you can filter the results by appending command line options for the yum group list command (`--hidden`, `--available`). For more available options see the man pages.

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- To list mandatory and optional packages contained in a particular group, use:

```
# yum group info group-name
```

Replace *group-name* with the name of the group.

❖ Installing a package group with YUM

- The following procedure describes how to install a package group by a group name or by a *groupID* using yum.
- To install a package group by a group name, use:

```
# yum group install group-name
```

Or

```
# yum install @group-name
```

Replace *group-name* with the full name of the group or environmental group.

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6. Specifying a package name in YUM input

- ❑ To optimize the installation and removal process, you can append `-n`, `-na`, or `-nevra` suffixes to `yum` `install` and `yum` `remove` commands to explicitly define how to parse an argument:
 - **To install a package using its exact name, use:** `# yum install-n name`
 - Replace *name* with the exact name of the package.
 - **To install a package using its exact name and architecture, use:** `# yum install-na name.architecture`
 - Replace *name* and *architecture* with the exact name and architecture of the package.
 - **To install a package using its exact name, epoch, version, release, and architecture, use:**
`# yum install-nevra name-epoch:version-release.architecture`
 - Replace *name*, *epoch*, *version*, *release*, and *architecture* with the exact name, epoch, version, release, and architecture of the package.



Updating Software Packages



Installing and updating software packages

Updating software packages

- ❑ **yum** allows you to check if your system has any pending updates. You can list packages that need updating and choose to update a single package, multiple packages, or all packages at once.
- ❑ If any of the packages you choose to update have dependencies, they are updated as well.
- **The following section describes how to use yum to:**
 1. Check for updates.
 2. Update a single package.
 3. Update a package group.
 4. Update all packages and their dependencies.

Installing and updating software packages

1. Checking for updates with YUM

- ❑ The following procedure describes how to check the available updates for packages installed on your system using yum.

➤ Procedure

- To see which packages installed on your system have available updates, use:

yum check-update

- The output returns the list of packages and their dependencies that have an update available.

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2. Updating a single package with YUM

- ❑ Use the following procedure to update a single package and its dependencies using yum.

- To update a package, use:

```
# yum update package-name
```

- ❑ Replace *package-name* with the name of the package.

→ Important

- ❑ When applying updates to kernel, **yum** always **installs** a new kernel regardless of whether you are using the yum update or yum install command.

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3. Updating a package group with YUM

- ❑ Use the following procedure to update a group of packages and their dependencies using yum.

➤ Procedure

- To update a package group, use:

```
# yum group update group-name
```

Replace *group-name* with the name of the package group.

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4. Updating all packages and their dependencies with YUM

- ❑ Use the following procedure to update all packages and their dependencies using yum.

➤ Procedure

- To update all packages and their dependencies, use:

```
# yum update
```

Installing and updating software packages

Installing Packages on RHEL 8 Locally Using ISO

❑ Benefits of Using RHEL 8 ISO as a Local Repository

- Allows you to apply offline patches.
- You can update your server in critical cases where you don't have an internet connection.
- Using local repo, you can create an [ultra-secure RHEL 8 environment](#) that will never be connected to the internet and still be updated with the most frequent packages.
- You can also upgrade the server from RHEL 8.x to RHEL 8.y.

Installing and updating software packages

❑ Often, when we want to have a local repository for our **RHEL 8** system to install packages without internet access for extra safety and using **RHEL 8** ISO is the easiest way to do that.

❑ In this guide, we will be showing you how you can configure and use locally downloaded **RHEL 8 ISO** images as a repository for installing packages in **RHEL 8** Linux.

[You might also like: [How to Create Local RHEL 9 Repository](#)]

❑ But before that, let's have a look at what are the advantages of using **RHEL 8** ISO as a local repository.

Installing and updating software packages

Installing Packages on RHEL 8 Locally Using ISO

Step 1: Download RHEL 8 ISO Image

- ❑ You can easily [download RHEL 8 ISO file](#) from Red Hat's official download page. While downloading ISO, make sure you avoid boot ISOs as they don't include packages that are less than 1GB in size.

Step 2: Mount RHEL 8 DVD ISO

- ❑ Once we are done downloading the ISO file, we have to create a mounting point for mounting the recently downloaded ISO file on our system.
- ❑ We will be creating a mounting point under the `/mnt` directory by using the given command:

```
mkdir -p /mnt/disc  
mount -o loop rhel-8.6-x86_64-dvd.iso /mnt/disc
```

```
[sagar@tecmint Downloads]$ sudo mount -o loop rhel-8.6-x86_64-dvd.iso /mnt/disc  
mount: /mnt/disc: WARNING: device write-protected, mounted read-only.  
[sagar@tecmint Downloads]$
```

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- ❑ Make sure you change the name of the ISO file before mounting or it will bring an error!

You might be wondering about the warning it gave us while we mounted our ISO but don't worry, we will change permissions in the latter part of this guide.

```
mkdir -p /mnt/disc  
mount /dev/sr0 /mnt/disc
```

While mounting, make sure you change **sr0** with your drive name.

Installing and updating software packages

Step 3: Creating Local RHEL 8 Repository

- ❑ After mounting **RHEL 8** ISO file at `/mnt`, we need to get a copy of the **media.repo** file and paste it to our system directory located at `/etc/yum.repos.d/` with the name of **rhel8.repo**.

```
cp /mnt/disc/media.repo /etc/yum.repos.d/rhel8.repo
```

- ❑ As we mentioned earlier, our drive is write-protected. But for our purpose, we have to change permissions of **rhel8.repo** file to **0644** which will allow us to read and make changes accordingly.

```
chmod 644 /etc/yum.repos.d/rhel8.repo
```

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- ❑ Once we are done with changing permissions, we have to make some changes to make our local repository work. First, let's open **rhel8.repo** file by utilizing the given command:

```
vi /etc/yum.repos.d/rhel8.repo
```

- Clear the default configuration and paste new instructions in the config file as given below:

```
[dvd-BaseOS]
name=DVD for RHEL - BaseOS
baseurl=file:///mnt/disc/BaseOS
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release

[dvd-AppStream]
name=DVD for RHEL - AppStream
baseurl=file:///mnt/disc/AppStream
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release
```

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The final result config file will look like this:

```
GNU nano 2.9.8 /etc/yum.repos.d/rhel8.repo

[dvd-BaseOS]
name=DVD for RHEL - BaseOS
baseurl=file:///mnt/disc/BaseOS
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release

[dvd-AppStream]
name=DVD for RHEL - AppStream
baseurl=file:///mnt/disc/AppStream
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release

[ Read 13 lines ]
^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text   ^J Justify    ^C Cur Pos    M-U Undo
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell   ^_ Go To Line  M-E Redo
```

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- ❑ After configuring the file, we need to clear the **YUM** cache by using the given [yum](#) or [dnf](#) command:

```
yum clean all
```

or

```
dnf clean all
```

- ❑ Now, let's list the enabled repositories on our system by the given command:

```
yum repolist enabled
```

```
[sagar@tecmint ~]$ sudo dnf repolist enabled
Updating Subscription Management repositories.
repo id                repo name
dvd-AppStream           DVD for RHEL - AppStream
dvd-BaseOS              DVD for RHEL - BaseOS
rhel-8-for-x86_64-appstream-rpms Red Hat Enterprise Linux 8 for x86_64 - AppStream (RPMs)
rhel-8-for-x86_64-baseos-rpms  Red Hat Enterprise Linux 8 for x86_64 - BaseOS (RPMs)
```

List RHEL 8 Local Repository

Installing and updating software packages

Now, let's update the repository index by using the given command:

```
yum update
```

```
dnf update
```

Summary

- Understand the concept of **software packages** and RPM-based package management.
- Use RPM, YUM, and DNF to **install**, **upgrade**, and **manage** software packages.
- **Search** for **packages**, **repositories**, and **package information** using **YUM**.
- **Manage** package dependencies, updates, and **package groups** effectively.
- **Check** for available software updates and **apply updates** using **YUM**.
- **Update** individual packages, package groups, or the entire system.
- Understand **Application Streams** and **modular package management** in RHEL 8.
- Configure and use a **local RHEL 8 ISO** repository for **offline** and **secure updates**.

Summary

- Understand the concept of **software packages** and RPM-based package management.
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- Configure and use a **local RHEL 8 ISO** repository for offline and **secure updates**.

Get started with Red Hat Enterprise Linux

- Describe and define open source, Linux distributions, Red Hat Enterprise Linux.

Access the command line

- Log into a Linux system
- run simple commands using the shell.

Manage files from the command line

- Copy, move, create, delete, and organize files while working from the bash shell.

Get help in Red Hat Enterprise Linux

- Resolve problems by using local help systems.

Create, view, and edit text files

- Manage text files from command output or in a text editor.

Manage local users and groups

- Create, manage, and delete local users and groups, as well as administer local password policies.

Control access to files

- Set Linux file system permissions on files
- interpret the security effects of different permission settings.

Monitor and manage Linux processes

- Evaluate and control processes running on a Red Hat Enterprise Linux system.

Control services and daemons

- Control and monitor network services
- system daemons using systemd.

Configure and secure SSH

- Configure secure command line service on remote systems, using OpenSSH.

Analyze and store logs

- Locate and accurately interpret logs of system events for troubleshooting purposes.

Manage networking

- Configure network interfaces and settings on Red Hat Enterprise Linux servers.

Archive and transfer files

- Archive and copy files from one system to another.

Install and update software

- Download, install, update, and manage software packages from Red Hat and yum package repositories.

Access Linux files systems

- Access, inspect, and use existing file systems on storage attached to a Linux server.

Thank You

