# Notes for Installing RedHawk™ Linux® 9.2 with Red Hat® Enterprise Linux® 9.2

## Installation Notes

July 25, 2023

READ ME BEFORE INSTALLING THIS PRODUCT

**concurrent REAL-TIME**

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# 1. Introduction

RedHawk Linux is supplied with Rocky Linux™ discs, however installing RedHawk with Red Hat Enterprise Linux (RHEL) discs is also fully supported by Concurrent Real-Time.

This document assists the user in installing the RedHawk 9.2 operating system onto a RHEL 9.2 distribution.  Both RHEL 9.2 Workstation and RHEL 9.2 Server installations are supported, but for brevity this document will generally refer to them both as simply RHEL 9.2.

The directions in this document supersede all others – they are specific to installing the software on Concurrent Real-Time's RedHawk systems. Other information provided as part of this release, when it may contradict Concurrent Real-Time's directions, should be ignored and Concurrent Real-Time's directions in this document should prevail.

**NOTE**

*"Red Hat," and "Red Hat Enterprise Linux" are trademarks or registered trademarks of Red Hat, Inc. in the US, and other countries. "Rocky Linux" is a registered trademark of the Rocky Enterprise Software Foundation.  "RedHawk" is a registered trademark of Concurrent Real-Time.  "Linux" is a registered trademark of Linus Torvalds. Red Hat, Inc., Rocky Enterprise Software Foundation and Linus Torvalds are in no way connected with or associated with Concurrent Real-Time.*

# 2. Requirements

You will need these resources to install RedHawk 9.2 onto a RHEL 9.2 distribution:

- A RHEL 9.2 installation disc or ISO
- A RedHawk Linux 9.2 installation disc
- The *RedHawk Release Notes* document for RedHawk 9.2
- The `required-pkgs.txt` file that matches your RHEL 9.2 product

If you do not already have a RHEL 9.2 installation disc or ISO, you will also need:

- A current and valid Red Hat account login ID and password
- A system with an external Internet connection

Optionally, once you have completed the basic installation of the RedHawk system, if you wish to update all the Red Hat provided RPM packages on the RedHawk system to their latest available versions, you will also need:

- A valid and unattached Red Hat subscription
- An external Internet connection on the RedHawk system you wish to update

**NOTE**

*Upgrades from earlier versions of RedHawk to version 9.2 are not supported. If you already have a RHEL 9.2 installation disc or ISO, you can skip directly to Section 4, "Install RHEL 9.2," below to begin the RHEL 9.2 installation.*

# 3. Download the RHEL 9.2 installation ISO

This section outlines several manual steps that you will need to perform over the Internet to download a RHEL 9.2 ISO image from the Red Hat Network.

## 3.1.    Establish a Red Hat account

If you do not already have a Red Hat account login you will need to create one via the Red Hat customer portal website.  Navigate a web browser to the following URL:

[http://access.redhat.com](http://access.redhat.com)

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Click the *little person* login icon ( Log in ) at the upper right of the page and then click the Register link.  Follow the registration instructions and enter all the required information to successfully establish your new account.

**NOTE**

*If you already have a Red Hat account with at least one active subscription you can click the Log In link, enter your existing login information, and skip directly to Section 3.3, "Download the RHEL 9.2 installation ISO," below.*

## 3.2.    Purchase a Red Hat support subscription

After initially creating your account, you will be required to confirm the supplied email address and then log back into the customer portal.  At this point you will see the main page of the customer portal.

The appearance of the main page changes frequently as it is mostly used as an online billboard for promoting a variety of Red Hat features and products, however you should always see these buttons at the top left of the page:

Subscriptions    Downloads    Containers    Support Cases

Click on the Subscriptions button and you will be presented with a page like the following:

The above example page indicates that the account has 0 active subscriptions. Thus, before you can download the RHEL 9.2 installation ISO you will need to purchase a subscription.

To purchase a subscription, navigate a web browser to the following URL:

http://redhat.com/store

You should see a page like the following:

## Featured products

### Red Hat Enterprise Linux Server

The world's leading enterprise Linux platform. Deploy it on physical systems, as a guest on the most widely available hypervisors, or in the cloud.

Starting at

US$349

Buy and download

### Red Hat JBoss Enterprise Application Platform

A fully certified Java™ EE container that includes everything needed to build, run, and manage Java-based services.

Starting at

US$8,000

Buy and download

### Red Hat Enterprise Linux Workstation

A Linux platform for more powerful systems or systems optimized for high-performance activities like graphics, animation, and scientific computing.

Starting at

US$299

Buy and download

After clicking on Buy and download for the desired product, you will be offered different support options (e.g., self-support vs. standard) and then you will be prompted to enter credit card information, etc. until the purchase process is complete.

Once your account has at least one active subscription, you will be able to download ISO images as described in the next section.

## 3.3.    Download the RHEL 9.2 installation ISO

Before you can install RedHawk 9.2, you must first install RHEL 9.2 on the system, which requires that you download an appropriate RHEL installation ISO from the Red Hat customer portal.  Log in to your Red Hat account and return to the customer portal, and click on the Downloads link that you will see at the top of the main page:

Subscriptions    Downloads    Containers    Support Cases

You will be taken to the Product Downloads page, where you can scroll down until you see the Red Hat Enterprise Linux product link:

**Red Hat Enterprise Linux**

Click on the Red Hat Enterprise Linux product link, and on the resulting page scroll down until you see the All Red Hat Enterprise Linux Downloads link:

**All Red Hat Enterprise Linux Downloads →**

Click on the All Red Hat Enterprise Linux Downloads link, and on the resulting page choose the product variant, version, and architecture that you wish to download.  For example, choose the following settings to select the 64-bit RHEL 9.2 product.

| **Product Variant:** | **Version:** | **Architecture:** |
|---|---|---|
| Red Hat Enterprise Linux for x86_64  ▼ | 9.2  ▼ | x86_64 |

**NOTE**

*Be careful to select the 9.2 version instead of the default version.*
*Over time the default version will move beyond version 9.2.*

Once the RHEL 9.2 product has been correctly selected, scroll the page down see the Binary DVD link that is associated with this product.  In this example, press the Download Now button to begin downloading the RHEL 9.2 64-bit Installation ISO.

Red Hat Enterprise Linux 9.2 Binary DVD  Recommended

Run the installation program and complete installation without requiring any additional package repositories. Use this image if the system you are installing will not have network access, as it contains all of the required packages to complete an installation of Red Hat Enterprise Linux.

Download Now 🗗
8.94 GB

Last modified: 2023-04-25    SHA-256 Checksum:
a18bf014e2cb5b6b9cee3ea09ccfd7bc2a84e68e09487bb119a98aa0e3563ac2

**NOTE**

*With RHEL 9 there are no longer separate Workstation and Server discs;*
*a single large ISO image can install both Server and Workstation.*

**NOTE**

*Red Hat erroneously displays that the ISO is a DVD ISO, but it won't fit on a DVD;*
*you can only burn the ISO onto an optical Blu-ray disc using a Blu-ray burner.*

Once the ISO has downloaded successfully you should now be ready to proceed with the next section.  However, it is always recommended to use the `sha256sum` command on Linux to verify that the installation ISO checksum matches the checksum displayed above before continuing.

**NOTE**

*Microsoft ® Windows ® operating system users can download and install the CoreUtils package from the gnuwin32.sourceforge.net project to get a native version of `shasum` which can be used to verify the installation ISO checksum.*

# 4. Install RHEL 9.2

Once the desired RHEL 9.2 installation ISO has downloaded, burn the ISO to a physical Blu-ray disc using your preferred ISO burning software, and then complete section 5.1.1 in the *RedHawk Release Notes* to perform a RHEL installation.

**NOTE**

*The RHEL 9.2 installation ISO is 8.94 GB in size and will only fit on a Blu-ray disc. Contact your system administrator if you need help burning Blu-ray discs.*

**NOTE**

*The screens shown in the RedHawk Release Notes are from Rocky Linux 9.2; the RHEL 9.2 screens will all have a different color scheme; however, the contents of each screen will be mostly identical to the Rocky Linux 9.2 screens.*

**NOTE**

*Concurrent Real-Time does not recommend registering with the Red Hat Network during the RHEL installation. If you wish to install RHEL updates after you have completed the RedHawk 9.2 installation, you can register the system and attach a subscription at that time. See section 7, "(Optional) Update Installed RHEL Packages," below for more information.*

Once the RHEL 9.2 installation is finished, proceed to the next section.

# 5. Install required packages

This section details the steps to install the RHEL packages that are required for RedHawk.
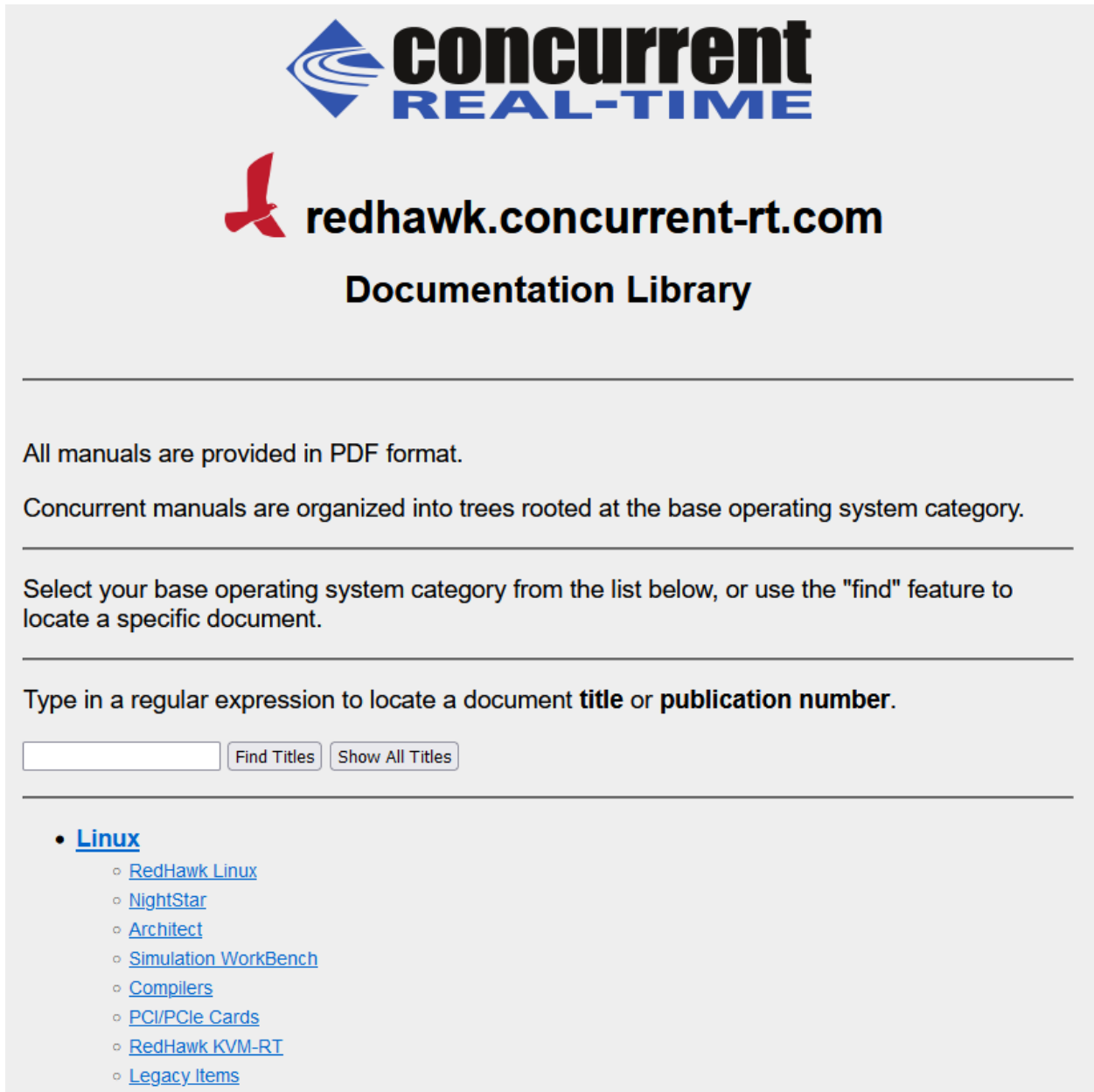
## 5.1. Download the `required-pkgs.txt` file

Concurrent Real-Time publishes *required packages* lists for customers supplying their own Red Hat software.  Installing all the required packages will ensure that RedHawk can be installed correctly.

If you do not already have a `required-pkgs.txt` file, you will need to download one from Concurrent Real-Time's Software Documentation Library.  Use a web browser to surf to this URL:

[http://redhawk.concurrent-rt.com/docs/](http://redhawk.concurrent-rt.com/docs/)

You should see a page like the following displayed:



Click on RedHawk Linux and then RedHawk Linux 9.2.  The page displayed will look like the following:

- **Linux**
  - *RedHawk Linux*
    - *RedHawk Linux 9.2*
      - 📕 Redhawk Linux 9.2 Release Notes
      - 📕 Redhawk User's Guide
      - 📕 RedHawk Frequency-Based Scheduler (FBS) User's Guide
      - 📕 Installing on RHEL
    - RedHawk Linux 8.4
    - RedHawk Linux 8.2
    - RedHawk Linux 8.0
    - RedHawk Linux 7.5
    - RedHawk Linux 7.3
    - RedHawk Linux 7.2
    - RedHawk Linux 7.0
    - RedHawk Linux 6.5
    - RedHawk Linux 6.3
    - RedHawk Linux 6.0
    - RedHawk Linux 5.4
    - RedHawk Linux 5.2
    - RedHawk Linux 5.1
    - RedHawk Linux 4.2
    - RedHawk Linux 4.1
    - RedHawk Linux 2.3
    - Archive
  - NightStar
  - Architect
  - Simulation WorkBench
  - Compilers
  - PCI/PCIe Cards
  - RedHawk KVM-RT
  - Legacy Items

Next, click on the Installing on RHEL link that is listed under RedHawk Linux 9.2 and the following files will appear for download:

- *Installing on RHEL*
  - 📕 RedHawk 9.2 with Red Hat Installation Notes
  - *rhel-9.2-svr-x86_64-required-pkgs*
  - *rhel-9.2-ws-x86_64-required-pkgs*

The first link under Installing on RHEL is a link to the latest version of this document that you are currently reading. The other links are the `required-pkgs.txt` files that are appropriate for the various versions of RHEL.

Download the `required-pkgs.txt` file that matches the version of RHEL you are installing.

## 5.2.    Transfer the RHEL 9.2 installation disc (if necessary)

You should already have downloaded the RHEL 9.2 installation ISO image, however if you only have access to a physical RHEL 9.2 installation disc you will need to temporarily transfer the disc to your system's hard drive in order to follow these procedures.

Insert the RHEL 9.2 installation disc into the system's Blu-ray optical media tray and issue the following command to temporarily create a copy of the RHEL 9.2 installation disc on the hard drive.

```
-- as root --
dd if=/dev/cdrom of=/tmp/rhel9.2-disc.iso
```

After this command completes, remove the RHEL 9.2 installation disc from the optical media drive as it will no longer be needed during the rest of this procedure.

If you have access to the original RHEL 9.2 installation ISO image that was downloaded from Red Hat, simply ensure that it is placed in /tmp with the name rhel9.2-disc.iso before continuing.


## 5.3.    Loopback mount the RHEL 9.2 installation ISO image

Issue the following commands to loopback mount the copy of the RHEL 9.2 installation ISO image.

```
-- as root --
# yum clean all
# mkdir -p /mnt/rhel9.2-disc
# mount -o loop,ro /tmp/rhel9.2-disc.iso /mnt/rhel9.2-disc
```

After these commands complete, the contents of the RHEL 9.2 installation ISO will be accessible under the /mnt/rhel9.2-disc mount point.

**NOTE**

*The upcoming steps will require the RHEL installation ISO image to be continuously loopback mounted.  You may wish to put the above mount command into /etc/rc.local to ensure that the ISO will be automatically re-mounted each time the system is rebooted.*


## 5.4.    Create a repository to access the RHEL 9.2 image

Using your preferred text editor, create a file named /etc/yum.repos.d/rhel9.2-disc.repo with the following contents:

```
[rhel9.2-disc-AppStream]
name=rhel9.2-disc-AppStream
baseurl=file:///mnt/rhel9.2-disc/AppStream
enabled=1
gpgcheck=0

[rhel9.2-disc-BaseOS]
name=rhel9.2-disc-BaseOS
baseurl=file:///mnt/rhel9.2-disc/BaseOS
enabled=1
gpgcheck=0
```

Once this yum repo file is in place, RPM dependencies should automatically be satisfied from the mounted RHEL 9.2 installation ISO image.

To verify that the RHEL installation disc repository is now set up correctly, issue the following command:

```
-- as root --
# yum repolist -v --noplugins
```

You should see output like the following displayed:

```
# yum repolist -v --noplugins
YUM version: 4.14.0
cachedir: /var/cache/dnf
Last metadata expiration check: 0:04:47 ago on Wed 26 Jul 2023 09:21:42 AM EDT.
Repo-id            : rhel9.2-disc-AppStream
Repo-name          : rhel9.2-disc-AppStream
Repo-revision      : 1681421088
Repo-updated       : Thu 13 Apr 2023 05:24:48 PM EDT
Repo-pkgs          : 5,574
Repo-available-pkgs: 5,441
Repo-size          : 6.9 G
Repo-baseurl       : file:///mnt/rhel9.2-disc/AppStream
Repo-expire        : 172,800 second(s) (last: Wed 26 Jul 2023 09:21:41 AM EDT)
Repo-filename      : /etc/yum.repos.d/rhel9.2-disc.repo

Repo-id            : rhel9.2-disc-BaseOS
Repo-name          : rhel9.2-disc-BaseOS
Repo-revision      : 1681421128
Repo-updated       : Thu 13 Apr 2023 05:25:29 PM EDT
Repo-pkgs          : 1,155
Repo-available-pkgs: 1,155
Repo-size          : 1.2 G
Repo-baseurl       : file:///mnt/rhel9.2-disc/BaseOS
Repo-expire        : 172,800 second(s) (last: Wed 26 Jul 2023 09:21:42 AM EDT)
Repo-filename      : /etc/yum.repos.d/rhel9.2-disc.repo
Total packages: 6,729
#
```

If you do not see a similar output, review the above steps to make sure that everything is mounted and configured correctly.


# 5.5.    Install required base packages

To install the required packages on a freshly installed RHEL 9.2 system, issue the following command as root on your system (this example assumes that you are using 64-bit RHEL Workstation and that the `required-pkgs.txt` file is in the current directory):

```
# yum -y --noplugins install $(<rhel-9.2-ws-x86_64-required-pkgs.txt)
```

Refer to section 5.1 above if you do not yet have an appropriate `required-pkgs.txt` file.  This command will produce many lines of output and may run for several minutes depending on the performance of the current system.

**NOTE**

*After installation completes, do not reboot the system.  Proceed to the next step.*

# 6. Install RedHawk Linux

The system is now ready for RedHawk and subsequent software to be installed.  Continue following section 5.2 of the *RedHawk Release Notes* to complete the installation.
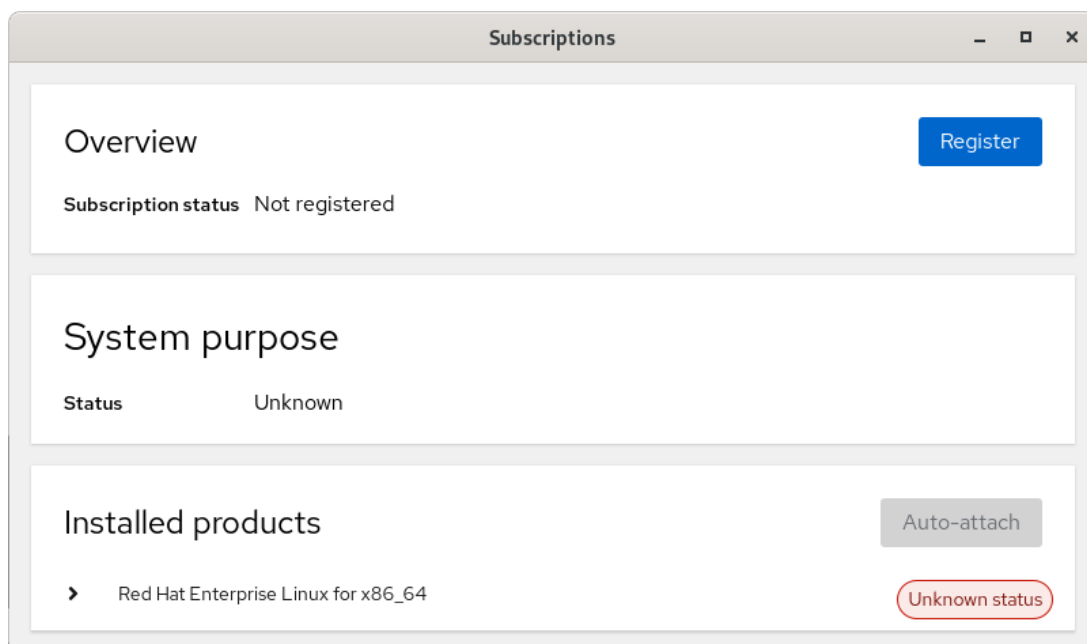
**NOTE**

*The required packages installed in Section 5.5 above should adequately satisfy the dependencies of RedHawk™ and NightStar™ software.  However, the installation of additional software packages may require other RHEL 9.2 base packages that have not yet been installed.  During the installation of additional software packages ensure that the RHEL 9.2 installation ISO is loopback mounted to have dependencies pulled in automatically as necessary.  Be sure to delete the RHEL 9.2 installation ISO file after all software installation has completed and remove or disable the* `/etc/yum.repos.d/rhel9.2-disc.repo` *file.*

# 7. (Optional) Update installed RHEL packages

Once a RedHawk system is fully installed using the approach detailed above, you may optionally choose to install all the latest RHEL package updates that have been released to date by Red Hat.  The following sections detail the steps required to register the system with the Red Hat Network, attach a subscription and update all installed RHEL packages to their latest available versions.

## 7.1.    Invoke the Red Hat Subscription Manager

First, log into the system in graphical mode as the root user and invoke the Red Hat Subscription Manager tool.  You can start the tool via the Applications menu by navigating to System Tools ⇨ Red Hat Subscription Manager.  After invocation, a window like the following will appear on the screen:



Click the Register button to register the system within the Red Hat Network, and a window like the following will next appear on the screen:

## Register System

| | |
|---|---|
| URL | Default ▼ |
| | ☐ Use proxy server |
| Method | ● Account ○ Activation key |
| | Username [                    ] |
| | Password [                    ] |
| | Organization [                    ] |
| Subscriptions | ☑ Attach automatically |
| Insights | ☑ Connect this system to Red Hat Insights ↗. |

[ Register ]   Cancel

Enter your Red Hat account Username and Password and press the Register button. *(Usage of a Red Hat Activation Keys is not covered in this document)*. The system will register with Red Hat and automatically attach a matching subscription, and you will see a confirmation window like the following displayed:



### Subscriptions    _  □  ✕

## Overview                                    [ Unregister ]

**Subscription status**  Current

**Organization**  00000000

**Insights**  Connected to Insights

↗ No rule hits

## System purpose

**Status**  Not Specified

## Installed products                          [ Auto-attach ]

> Red Hat Enterprise Linux for x86_64                    ( Subscribed )

Click on the Red Hat Enterprise Linux for x86_64 text under Installed products to see the details of the subscription attachment and you should see details like the following displayed:

## Installed products

Auto-attach

Red Hat Enterprise Linux for x86_64                                                    Subscribed

| | |
|---|---|
| Product name | Red Hat Enterprise Linux for x86_64 |
| Product ID | 479 |
| Version | 9.2 |
| Arch | x86_64 |
| Status | Subscribed |
| Starts | 3/1/2023 |
| Ends | 3/1/2024 |

This window confirms that the system has been properly registered and subscribed, and you can now close the Red Hat Subscription Manager tool.

# 7.2.    Update Installed RHEL Packages

Finally, issue the following command as the root user to download and install the latest versions of the RHEL packages that you have installed on your system:

```
-- as root --
# yum -y update
```

You can also run this command without the "-y" option if you just wish to see which updates are available; without the "-y" option, the command will prompt you to continue, and you can choose to continue or exit out if you wish.  This command may take quite a while to complete, depending on how many updates are available at the time of invocation.

Please contact Concurrent Real-Time Technical Support if you have any problems during any stage of this installation (support@concurrent-rt.com or 1-800-245-6453).