Red Hat Enterprise Linux 8

Upgrading to RHEL 8

Instructions for an in-place upgrade to Red Hat Enterprise Linux 8
Red Hat Enterprise Linux 8 Upgrading to RHEL 8

Instructions for an in-place upgrade to Red Hat Enterprise Linux 8
Abstract

This document provides instructions on how to perform an in-place upgrade from Red Hat Enterprise Linux 7 to Red Hat Enterprise Linux 8 using the Leapp utility. During the in-place upgrade, the existing RHEL 7 operating system is replaced by a RHEL 8 version.
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PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

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- For simple comments on specific passages:
  1. Make sure you are viewing the documentation in the *Multi-page HTML* format. In addition, ensure you see the **Feedback** button in the upper right corner of the document.
  2. Use your mouse cursor to highlight the part of text that you want to comment on.
  3. Click the **Add Feedback** pop-up that appears below the highlighted text.
  4. Follow the displayed instructions.

- For submitting more complex feedback, create a Bugzilla ticket:
  1. Go to the **Bugzilla** website.
  2. As the Component, use **Documentation**.
  3. Fill in the **Description** field with your suggestion for improvement. Include a link to the relevant part(s) of documentation.
  4. Click **Submit Bug**.
CHAPTER 1. REQUIREMENTS AND KNOWN LIMITATIONS

1.1. REQUIREMENTS

An in-place upgrade is currently supported only from RHEL 7.6 to RHEL 8.1 on systems meeting the following requirements:

- RHEL 7.6 installed

**IMPORTANT**

Upgrade from RHEL 7.7 and later versions is not supported. See *Supported in-place upgrade paths for Red Hat Enterprise Linux* for a list of supported and planned upgrade paths.

- The Server variant
- Either of the following architectures: 64-bit Intel, 64-bit ARM, IBM POWER (little endian), IBM Z
- The appropriate RHEL 7 Extended Update Support (EUS) repositories enabled if available, see *Appendix A, RHEL 7 repositories*. The EUS repositories ensure access to the most recent updates.
- FIPS mode disabled; see the solution *How to disable FIPS mode in RHEL 6 or RHEL 7*
- Minimum hardware requirements for RHEL 8; see *Red Hat Enterprise Linux technology capabilities and limits*
- The system registered to the Red Hat Content Delivery Network or Red Hat Satellite 6.5 or later using the Red Hat Subscription Manager

1.2. KNOWN LIMITATIONS

Notable known limitations currently include:

- A rollback to the last known good state has not been implemented in the *Leapp* utility. A complete system backup prior to the upgrade is recommended, for example, by using the Relax-and-Recover (ReaR) utility. For more information, see the *ReaR documentation* and *What is Relax and Recover (ReaR) and how can I use it for disaster recovery?*.

- Packages that are not a part of the Minimal (@minimal) or Base (@base) package groups can cause the upgrade to fail.

- Encryption of the whole disk or a partition, or file-system encryption currently cannot be used on a system targeted for an in-place upgrade.

- No Multipath or any kind of network storage mount can be used as a system partition (for example, iSCSI, FCoE, or NFS).

- During the upgrade process, the *Leapp* utility sets SELinux mode to permissive.

- No support for other Red Hat products running on top of the OS, Red Hat Software Collections, Red Hat Developer Tools, or add-ons, such as High Availability or Network Function Virtualization, is currently provided.
On systems where the root file system is formatted as XFS with ftype=0 (default in RHEL 7.2 and earlier versions), the RPM upgrade transaction calculation can fail if numerous packages are installed on the system. If the cause of such a failure is insufficient space, increase the available space by using the LEAPP_OVL_SIZE=<SIZE_IN_MB> environment variable with the leapp upgrade command, and set the size to more than 2048 MB (see a related solution for more information). To determine the ftype value, use the xfs_info command.

The in-place upgrade is currently unsupported for on-demand instances on Public Clouds (Amazon EC2, Azure, Huawei Cloud, Alibaba Cloud, Google Cloud) that use Red Hat Update Infrastructure but not Red Hat Subscription Manager for a RHEL subscription.

See also Section 6.3, “Known issues”.
CHAPTER 2. PREPARING A RHEL 7 SYSTEM FOR THE UPGRADE

This procedure describes the steps that are necessary before performing an in-place upgrade to RHEL 8 using the Leapp utility.

Prerequisites

- The system meets conditions listed in Chapter 1, Requirements and known limitations.

Procedure

1. Make sure your system has been successfully registered to the Red Hat Content Delivery Network (CDN) or Red Hat Satellite 6.5 or later using the Red Hat Subscription Manager.

   NOTE
   
   If your system is registered to a Satellite Server, you need to make the RHEL 8 repositories available by importing a Subscription Manifest file, created in the Red Hat Customer Portal, into the Satellite Server. For instructions, see the Managing Subscriptions section in the Content Management Guide for the particular version of Red Hat Satellite, for example, for version 6.5.

2. Verify that you have the Red Hat Enterprise Linux Server subscription attached:

   ```
   # subscription-manager list --installed
   +-------------------------------------------+
   | Installed Product Status                  |
   +-------------------------------------------+
   | Product Name:    Red Hat Enterprise Linux Server |
   | Product ID:      69                         |
   | Version:         7.6                         |
   | Arch:            x86_64                      |
   | Status:          Subscribed                 |
   ```

3. Make sure you have the RHEL 7 EUS repositories enabled if they are available for the given architecture and repository. This is necessary for a successful update of the RHEL 7.6 system to the latest versions of packages in step 6 of this procedure, and a prerequisite for a supported in-place upgrade scenario.

   The following commands list repositories for the 64-bit Intel architecture; for other architectures, see Appendix A, RHEL 7 repositories.

   a. Enable the Base EUS repository:

      ```
      # subscription-manager repos --disable rhel-7-server-rpms --enable rhel-7-server-eus-rpms
      ```

   b. Enable the Extras repository where Leapp and its dependencies are available:

      ```
      # subscription-manager repos --enable rhel-7-server-extras-rpms
      ```

   c. If you have the Optional repository enabled, enable the Optional EUS repository:
# subscription-manager repos --disable rhel-7-server-optional-rpms --enable rhel-7-server-eus-optional-rpms

d. If you have the Supplementary repository enabled, enable the Supplementary EUS repository:

# subscription-manager repos --disable rhel-7-server-supplementary-rpms --enable rhel-7-server-eus-supplementary-rpms

4. If you use the yum-plugin-versionlock plug-in to lock packages to a specific version, clear the lock by running:

# yum versionlock clear

See How to restrict yum to install or upgrade a package to a fixed specific package version? for more information.

5. Set the Red Hat Subscription Manager to consume the RHEL 7.6 content:

# subscription-manager release --set 7.6

**IMPORTANT**

The upgrade is designed for RHEL 7.6 as a starting point. If you have any packages from RHEL 7.7 or later installed on your system, the in-place upgrade is unsupported.

6. Ensure you have the system locale set to **en_US.UTF-8**:

$ cat /etc/locale.conf

If the locale is different, follow instructions in How to change system locale on RHEL7.

7. Update all packages to the latest RHEL 7.6 EUS version:

# yum update

8. Reboot the system:

# reboot

9. Install the Leapp utility:

# yum install leapp

10. Download additional required data files (RPM package changes and RPM repository mapping) attached to the Knowledgebase article Data required by the Leapp utility for an in-place upgrade from RHEL 7 to RHEL 8 and place them in the /etc/leapp/files/ directory.

11. Make sure you have any configuration management (such as Salt, Chef, Puppet, Ansible) disabled or adequately reconfigured to not attempt to restore the original RHEL 7 system.
12. Make sure your system does not use more than one Network Interface Card (NIC) with a name based on the prefix used by the kernel (eth). For instructions on how to migrate to another naming scheme before an in-place upgrade to RHEL 8, see How to perform an in-place upgrade to RHEL 8 when using kernel NIC names on RHEL 7.

13. Make sure you have a full system backup or a virtual machine snapshot. You should be able to get your system to the pre-upgrade state if you follow standard disaster recovery procedures within your environment.
CHAPTER 3. ASSESSING UPGRADABILITY IN THE PRE-UPGRADE PHASE

During the pre-upgrade process, the Leapp utility collects data about the system, assesses upgradability, and produces a pre-upgrade report in the /var/log/leapp/leapp-report.txt file and in the web console. The report summarizes potential problems and proposes recommended resolutions. The report also helps you decide whether it is possible or advisable to proceed with the upgrade. Additionally, the web console enables you to apply automated remediations.

**IMPORTANT**

During the pre-upgrade phase, Leapp neither simulates the whole in-place upgrade process nor downloads all RPM packages, and even if no problems are reported in pre-upgrade report, Leapp can still inhibit the upgrade process in later phases. For more information, see Chapter 6, Troubleshooting.

### 3.1. PERFORMING THE PRE-UPGRADE ASSESSMENT FROM THE COMMAND LINE

This procedure describes how to identify potential upgrade problems during the pre-upgrade phase using the command-line interface.

**Prerequisites**

- The steps listed in Chapter 2, Preparing a RHEL 7 system for the upgrade have been completed.

**Procedure**

1. On your RHEL 7 system, perform the pre-upgrade phase:

   ```sh
   # leapp preupgrade
   ```

2. Examine the report in the /var/log/leapp/leapp-report.txt file and manually resolve all the reported problems before proceeding with the in-place upgrade.

### 3.2. PERFORMING THE PRE-UPGRADE ASSESSMENT AND REMEDIATIONS IN THE WEB CONSOLE

This procedure describes how to identify potential problems in the pre-upgrade phase and how to apply automated remediations using the web console.

**Prerequisites**

- The steps listed in Chapter 2, Preparing a RHEL 7 system for the upgrade have been completed.

**Procedure**

1. Install the cockpit-leapp plug-in:

   ```sh
   # yum install cockpit-leapp
   ```
2. Navigate to the web console in your browser and log in as root or as a user with sufficient privileges. See Managing systems using the RHEL 7 web console for more information about the web console.

3. On your RHEL 7 system, perform the pre-upgrade phase either from the command-line interface or from the web console terminal:

```
# leapp preupgrade
```

4. In the web console, select In-place Upgrade Report from the left menu.

**Figure 3.1. In-place upgrade report in the web console**

The report table provides an overview of the problems found, their risk assessment, and remediations (if available).

- **Risk factor:**
  - High - very likely to result in a deteriorated system state
  - Medium - can impact both the system and applications
  - Low - should not impact the system but can have an impact on applications

- **Inhibitor** - will inhibit (hard stop) the upgrade process, otherwise the system could become unbootable, inaccessible, or dysfunctional

- **Remediation** - an actionable solution to a reported problem:
  - Remediation command - can be executed directly through the web console
  - Remediation hint - instructions on how to resolve the problem manually
5. Examine the content of the report. You can sort the table by clicking a header. To open a detail pane, click a selected row.

Figure 3.2. Detail pane

<table>
<thead>
<tr>
<th>Title</th>
<th>Packages not signed by Red Hat found in the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>26.08.2019 15:23:57</td>
</tr>
<tr>
<td>Risk factor</td>
<td>High</td>
</tr>
</tbody>
</table>

Summary

The following packages have not been signed by Red Hat and may be removed in the upgrade process: - leapp - leapp-deps - leapp-repository - leapp-repository-deps - leapp-repository-sos-plugin - python2-leapp - snactor

Links

- Information about package signatures

Remediations

![Run Remediation | Add to Remediation Plan]

Command: yum remove leapp leapp-deps leapp-repository

Related resources

- leapp
- leapp-deps
- leapp-repository

The detail pane displays the following additional information:

- Summary of the problem and links to Knowledgebase articles describing the problem in more detail
- Remediations - you can run or schedule an automated remediation (if available), and see its results when applied
- Affected system resources: packages, repositories, files (configuration, data), disks, volumes
6. Optionally filter the results. Click the **Filters** button in the top left corner above the report and apply a filter based on your preferences. Filter categories are applied in conjunction with one another.

**Figure 3.3. Filters**

- Is inhibitor?
- Has remediation hint?
- Has remediation command?
- Has links?

- Risk factor
- Audiences
- Time
- Drivers
- Packages

7. Select issues for which you want to apply an automated remediation. You have two options:

   a. Choose individual items by clicking the **Add to Remediation Plan** button in the detail pane. Alternatively, you can execute individual remediations directly by clicking **Run Remediation** in the detail pane.

   b. Select all items for which a remediation is available by clicking the **Add all remediations to plan** button in the top right corner above the report.

8. Open the remediation plan by clicking the **Remediation plan** link in the top right corner above the report. The remediation plan provides a list of all executed or scheduled remediations.

**Figure 3.4. Remediation plan**

9. Process all scheduled remediations by clicking **Execute Remediation Plan**. The following information is displayed for each remediation entry:
- A unique ID of the remediation
- Exit status of the command
- Elapsed time of the executed remediation
- Standard output
- Standard error

10. After executing selected remediations, generate the pre-upgrade report again to make sure the remediations were correctly applied:

```bash
# leapp preupgrade
```
CHAPTER 4. PERFORMING THE UPGRADE FROM RHEL 7 TO RHEL 8

This procedure describes how to upgrade to RHEL 8 using the Leapp utility.

Prerequisites

- The steps listed in Chapter 2, Preparing a RHEL 7 system for the upgrade have been completed, including a full system backup.
- The steps listed in Chapter 3, Assessing upgradability in the pre-upgrade phase have been completed and all reported issues resolved.

Procedure

1. On your RHEL 7 system, start the upgrade process:

   # leapp upgrade

   At the beginning of the upgrade process, Leapp performs the pre-upgrade phase described in Chapter 3, Assessing upgradability in the pre-upgrade phase.

   If the system is upgradable, Leapp downloads necessary data and prepares an RPM transaction for the upgrade.

   If your system does not meet the parameters for a reliable upgrade, Leapp terminates the upgrade process and provides a record describing the issue and a recommended solution in the /var/log/leapp/leapp-report.txt file. For more information, see Chapter 6, Troubleshooting.

2. Manually reboot the system:

   # reboot

   In this phase, the system boots into a RHEL 8-based initial RAM disk image, initramfs. Leapp upgrades all packages and automatically reboots to the RHEL 8 system.

   If a failure occurs, investigate logs as described in Chapter 6, Troubleshooting.

3. Perform the following post-upgrade tasks:

   a. Log in to the RHEL 8 system.

   b. Change SELinux mode to enforcing:

      - Ensure that there are no SELinux denials before you switch from permissive mode, for example, by using the ausearch utility. See Chapter 6, Troubleshooting for more details.
      - Enable SELinux in enforcing mode:

         # setenforce 1

   c. Verify the state of the system as described in Chapter 5, Verifying the post-upgrade state of the RHEL 8 system.
CHAPTER 5. VERIFYING THE POST-UPGRADE STATE OF THE RHEL 8 SYSTEM

This procedure lists steps recommended to perform after an in-place upgrade to RHEL 8.

Prerequisites

- The system has been upgraded following the steps described in Chapter 4, Performing the upgrade from RHEL 7 to RHEL 8 and you have been able to log in to RHEL 8.

Procedure

After the upgrade completes, determine whether the system is in the required state, at least:

- Verify that the current OS version is Red Hat Enterprise Linux 8:
  
  ```
  # cat /etc/redhat-release
  Red Hat Enterprise Linux release 8.1 (Ootpa)
  ```

- Check the OS kernel version:
  
  ```
  # uname -r
  4.18.0-147.el8.x86_64
  ```

  Note that `.el8` is important.

- Verify that the correct product is installed:
  
  ```
  # subscription-manager list --installed
  +-----------------------------------------+
  | Installed Product Status                |
  +-----------------------------------------+
  | Product Name: Red Hat Enterprise Linux for x86_64 |
  | Product ID: 479                           |
  | Version: 8.1                             |
  | Arch: x86_64                             |
  | Status: Subscribed                       |
  ```

- Verify that the release version is correctly set to 8.1:
  
  ```
  # subscription-manager release
  Release: 8.1
  ```

  Note that when the release version is set to 8.1, you will be receiving `yum` updates only for this specific version of RHEL. If you want to unset the release version to be able to consume updates from the latest minor version of RHEL 8, use the following command:

  ```
  # subscription-manager release --unset
  ```

- Verify that network services are operational, for example, try to connect to a server using SSH.
CHAPTER 6. TROUBLESHOOTING

This chapter lists troubleshooting resources and tips.

6.1. TROUBLESHOOTING RESOURCES

Console output
By default, only error and critical log level messages are printed to the console output by the Leapp utility. To change the log level, use the --verbose or --debug options with the leapp upgrade command.

- In verbose mode, Leapp prints info, warning, error, and critical messages.
- In debug mode, Leapp prints debug, info, warning, error, and critical messages.

Logs
- The /var/log/leapp/leapp-upgrade.log file lists issues found during the initramfs phase.
- The /var/log/leapp/dnf-debugdata/ directory contains transaction debug data. This directory is present only if the leapp upgrade command is executed with the --debug option.
- The journalctl utility provides complete logs.

Reports
- The /var/log/leapp/leapp-report.txt file lists issues found during the pre-upgrade phase. The report is also available in the web console, see Section 3.2, "Performing the pre-upgrade assessment and remediations in the web console".

6.2. TROUBLESHOOTING TIPS

Pre-upgrade phase
- Verify that your system meets all conditions listed in Chapter 1, Requirements and known limitations.
- Make sure you have followed all steps described in Chapter 2, Preparing a RHEL 7 system for the upgrade, for example, your system does not use more than one Network Interface Card (NIC) with a name based on the prefix used by the kernel (eth).
- If the following error message is returned when you are trying to enable an EUS repository:

```
Error: ‘rhel-7-server-eus-rpms’ does not match a valid repository ID.
```

make sure your subscription includes the Red Hat Enterprise Linux for <architecture> - Extended Update Support product, where <architecture> is one of the following: x86_64, Power, little endian, IBM z Systems. You can purchase the EUS add-on for the 64-bit Intel architecture or contact a sales representative.
- Investigate the pre-upgrade report in the /var/log/leapp/leapp-report.txt file to determine the problem and a recommended solution. Alternatively, use the web console, as described in Section 3.2, “Performing the pre-upgrade assessment and remediations in the web console”.

Download phase
If a problem occurs during downloading RPM packages, examine transaction debug data located in the /var/log/leapp/dnf-debugdata/ directory.

initramfs phase

- During this phase, potential failures redirect you into the dracut shell. Check the journal:

  # journalctl

  Alternatively, restart the system from the dracut shell using the `reboot` command and check the /var/log/leapp/leapp-upgrade.log file.

Post-upgrade phase

- If your system seems to be successfully upgraded but booted with the old RHEL 7 kernel, restart the system and check the kernel version of the default entry in GRUB.

- Make sure you have followed the recommended steps in Chapter 5, Verifying the post-upgrade state of the RHEL 8 system.

- If your application or a service stops working or behaves incorrectly after you have switched SELinux to enforcing mode, search for denials using the `ausearch`, `journalctl`, or `dmesg` utilities:

  # ausearch -m AVC,USER_AVC -ts recent
  # journalctl -t setroubleshoot
  # dmesg | grep -i -e selinux -e type=1400

  The most common problems are caused by incorrect labeling. See Troubleshooting problems related to SELinux for more details.

6.3. KNOWN ISSUES

- Network teaming currently does not work when the in-place upgrade is performed while Network Manager is disabled or not installed.

- If you use an HTTP proxy, Red Hat Subscription Manager must be configured to use such a proxy, or the `subscription-manager` command must be executed with the `--proxy <hostname>` option. Otherwise, an execution of the `subscription-manager` command fails. If you use the `--proxy` option instead of the configuration change, the upgrade process fails because Leapp is unable to detect the proxy. To prevent this problem from occurring, manually edit the `rhsm.conf` file as described in How to configure HTTP Proxy for Red Hat Subscription Management. (BZ#1689294)

- If your RHEL 7 system is installed on an FCoE Logical Unit Number (LUN) and connected to a network card that uses the `bnx2fc` driver, the LUN is not detected in RHEL 8 after the upgrade. Consequently, the upgraded system fails to boot. (BZ#1718147)

- If your RHEL 7 system uses a device driver that is provided by Red Hat but is not available in RHEL 8, Leapp will inhibit the upgrade. However, if the RHEL 7 system uses a third-party device driver that is not included in the list of removed drivers (located at /etc/leapp/repos.d/system_upgrade/el7toel8/actors/kernel/checkkerneldrivers/files/remove_d_drivers.txt), Leapp will not detect such a driver and will proceed with the upgrade. Consequently, the system might fail to boot after the upgrade.

- On non-UEFI systems, a traceback message similar to the following example might occur:
It is safe to ignore such messages, which do not affect the result of the upgrade process.

- If an OpenStack configuration drive with the iso9660 type file system is present on the RHEL 7 system, the upgrade process might hang in the initramfs phase. To prevent the problem from occurring, remove such a drive from the system before the upgrade and re-create it on the upgraded system. (BZ#1712456)

- It is currently impossible to perform an in-place upgrade when the winbind and wins Samba modules are used in the /etc/nsswitch.conf file. The upgrade transaction fails with the following error messages and Leapp inhibits the upgrade:

```
upgrade[469]: STDERR:
upgrade[469]: Error in PREIN scriptlet in rpm package unbound-libs
upgrade[469]: Error: Transaction failed
upgrade[469]: Container el8userspace failed with error code 1.
unbound-libs has a PREIN failure
```

To work around this problem, configure the system so that it uses only local providers for the user, groups, and hosts database during the update:

1. Open the system /etc/nsswitch.conf configuration file and search for entries that contain the winbind or wins strings.

2. If you find such entries, create a backup of /etc/nsswitch.conf.

3. Edit /etc/nsswitch.conf and remove winbind or wins from the entries that contain them.

4. Perform an in-place upgrade.

5. After the upgrade, add the winbind and wins strings to the respective entries in /etc/nsswitch.conf, based on your system configuration requirements. (BZ#1410154)

- The Leapp utility does not change customized authentication configuration during the upgrade process. If you used the deprecated authconfig utility to configure authentication on your RHEL 7 system, authentication on RHEL 8 might not work correctly. To ensure that your custom configuration functions properly on the RHEL 8 system, re-configure your RHEL 8 system with the authselect utility.
IMPORTANT

During the in-place upgrade, the deprecated `pam_krb5` or `pam_pkcs11` pluggable authentication modules (PAM) are removed. Consequently, if the PAM configuration on your RHEL 7 system contains the `pam_krb5` or `pam_pkcs11` modules and if these modules have the `required` or `requisite` control values, performing the in-place upgrade might result in locking you out of the system. To work around this problem, reconfigure your RHEL 7 system to not use `pam_krb5` or `pam_pkcs11` before you start the upgrade process.

- The upgrade process fails in the pre-upgrade phase if more than one `kernel-devel` packages are installed. To prevent the problem from occurring, remove the `kernel-devel` packages corresponding to the kernels that are not in use, and ensure only one `kernel-devel` package at maximum is installed.

- On IBM Z systems, `Leapp` always expects a DASD disk attached. Consequently, if the `/etc/dasd.conf` file does not exist, the in-place upgrade fails. To work around this problem, create an empty `dasd.conf` file by using the `touch > /etc/dasd.conf` command. (BZ#1783248)

6.4. OBTAINING SUPPORT

To open a support case, select `RHEL 8` as the product, and provide a sosreport from your system. To generate a sosreport on your system, run:

```bash
# sosreport
```

Note that you can leave the case ID empty.

For details on generating a sosreport, see the solution What is a sosreport and how to create one in Red Hat Enterprise Linux?.

For more information on opening and managing a support case on the Customer Portal, see the article How do I open and manage a support case on the Customer Portal?.

For more information on troubleshooting, see the chapter How do I troubleshoot a problem in Red Hat Enterprise Linux?.
CHAPTER 7. RELATED INFORMATION

- Red Hat Enterprise Linux technology capabilities and limits
- Considerations in adopting RHEL 8
- How do I upgrade from Red Hat Enterprise Linux 6 to Red Hat Enterprise Linux 7?
- How to convert from CentOS or Oracle Linux to RHEL
APPENDIX A. RHEL 7 REPOSITORIES

Before the upgrade, it is necessary to have appropriate repositories enabled as described in step 3 of the procedure in Chapter 2, Preparing a RHEL 7 system for the upgrade.

It is especially necessary to have the appropriate Extended Update Support (EUS) repositories enabled if they are available for the given architecture and repository. Make sure your subscription includes the Red Hat Enterprise Linux for <architecture> - Extended Update Support product, where <architecture> is one of the following: x86_64, Power, little endian, IBM z Systems. You can purchase the EUS add-on for the 64-bit Intel architecture or contact a sales representative.

**NOTE**

EUS repositories are not available for the following architectures: 64-bit ARM, IBM POWER9 (little endian), IBM Z (Structure A).

The following repositories must be enabled before the upgrade by using the `subscription-manager repos --enable repoid` command:

<table>
<thead>
<tr>
<th>Architecture</th>
<th>Repository</th>
<th>Repository ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>64-bit Intel</td>
<td>Base</td>
<td>rhel-7-server-eus-rpms</td>
</tr>
<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-server-extras-rpms</td>
</tr>
<tr>
<td>64-bit ARM</td>
<td>Base</td>
<td>rhel-7-for-arm-64-rpms</td>
</tr>
<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-for-arm-64-extras-rpms</td>
</tr>
<tr>
<td>IBM POWER8 (little endian)</td>
<td>Base</td>
<td>rhel-7-for-power-le-eus-rpms</td>
</tr>
<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-for-power-le-extras-rpms</td>
</tr>
<tr>
<td>IBM POWER9 (little endian)</td>
<td>Base</td>
<td>rhel-7-for-power-9-rpms</td>
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<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-for-power-9-extras-rpms</td>
</tr>
<tr>
<td>IBM Z</td>
<td>Base</td>
<td>rhel-7-for-system-z-eus-rpms</td>
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<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-for-system-z-extras-rpms</td>
</tr>
<tr>
<td>IBM Z (Structure A)</td>
<td>Base</td>
<td>rhel-7-for-system-z-a-rpms</td>
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<tr>
<td></td>
<td>Extras</td>
<td>rhel-7-for-system-z-a-extras-rpms</td>
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</tbody>
</table>

The following repositories can be enabled before the upgrade by using the `subscription-manager repos --enable repoid` command:
### Architecture | Repository | Repository ID
--- | --- | ---
64-bit Intel | Optional | rhel-7-server-eus-optional-rpms
 | Supplementary | rhel-7-server-eus-supplementary-rpms
64-bit ARM | Optional | rhel-7-for-arm-64-optional-rpms
 | Supplementary | N/A
IBM POWER8 (little endian) | Optional | rhel-7-for-power-le-eus-optional-rpms
 | Supplementary | rhel-7-for-power-le-eus-supplementary-rpms
IBM POWER9 (little endian) | Optional | rhel-7-for-power-9-optional-rpms
 | Supplementary | rhel-7-for-power-9-supplementary-rpms
IBM Z | Optional | rhel-7-for-system-z-eus-optional-rpms
 | Supplementary | rhel-7-for-system-z-eus-supplementary-rpms
IBM Z (Structure A) | Optional | rhel-7-for-system-z-a-optional-rpms
 | Supplementary | N/A

The following repositories should be disabled by using the `subscription-manager repos --disable repoid` command, and their corresponding EUS repositories enabled (see the tables above):

### Architecture | Repository | Repository ID
--- | --- | ---
64-bit Intel | Base | rhel-7-server-rpms
 | Optional | rhel-7-server-optional-rpms
 | Supplementary | rhel-7-server-supplementary-rpms
IBM POWER8 (little endian) | Base | rhel-7-for-power-le-rpms
 | Optional | rhel-7-for-power-le-optional-rpms
 | Supplementary | rhel-7-for-power-le-supplementary-rpms
IBM Z | Base | rhel-7-for-system-z-rpms
 | Optional | rhel-7-for-system-z-optional-rpms
<table>
<thead>
<tr>
<th>Architecture</th>
<th>Repository</th>
<th>Repository ID</th>
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<tbody>
<tr>
<td>Supplementary</td>
<td></td>
<td>rhel-7-for-system-z-supplementary-rpms</td>
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