Red Hat Software Collections 2.x 2.3 Release Notes

Release Notes for Red Hat Software Collections 2.3

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Abstract

The Red Hat Software Collections 2.3 Release Notes document the major features and contain important information about known problems in Red Hat Software Collections 2.3. The Red Hat Developer Toolset collection is documented in the Red Hat Developer Toolset Release Notes and the Red Hat Developer Toolset User Guide.

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Chapter 1. Red Hat Software Collections 2.3

This chapter serves as an overview of the Red Hat Software Collections 2.3 content set. It provides a list of components and their descriptions, sums up changes in this version, documents relevant compatibility information, and lists known issues.

1.1. About Red Hat Software Collections

For certain applications, more recent versions of some software components are often needed in order to use their latest new features. **Red Hat Software Collections** is a Red Hat offering that provides a set of dynamic programming languages, database servers, and various related packages that are either more recent than their equivalent versions included in the base Red Hat Enterprise Linux system, or are available for this system for the first time.

Red Hat Software Collections 2.3 is be available for Red Hat Enterprise Linux 7; selected new components and previously released components also for Red Hat Enterprise Linux 6. For a complete list of components that are distributed as part of Red Hat Software Collections and a brief summary of their features, see Section 1.2, “Main Features”.

Red Hat Software Collections does not replace the default system tools provided with Red Hat Enterprise Linux 6 or Red Hat Enterprise Linux 7. Instead, a parallel set of tools is installed in the `/opt/` directory and can be optionally enabled per application by the user using the supplied `scl` utility. The default versions of Perl or PostgreSQL, for example, remain those provided by the base Red Hat Enterprise Linux system.

All Red Hat Software Collections components are fully supported under Red Hat Enterprise Linux Subscription Level Agreements, are functionally complete, and are intended for production use. Important bug fix and security errata are issued to Red Hat Software Collections subscribers in a similar manner to Red Hat Enterprise Linux for at least two years from the release of each major version. In each major release stream, each version of a selected component remains backward compatible. For detailed information about length of support for individual components, refer to the Red Hat Software Collections Product Life Cycle document.

1.1.1. Red Hat Developer Toolset

Red Hat Developer Toolset is a part of Red Hat Software Collections, included as a separate Software Collection. For more information about Red Hat Developer Toolset, refer to the Red Hat Developer Toolset Release Notes and the Red Hat Developer Toolset User Guide.

1.2. Main Features

Red Hat Software Collections 2.3 provides recent stable versions of the tools listed in Table 1.1, “Red Hat Software Collections 2.3 Components”.

Table 1.1. Red Hat Software Collections 2.3 Components

Component	Software Collection	Description

Component	Software Collection	Description
Red Hat Developer Toolset 6.0	*devtoolset-6*	Red Hat Developer Toolset is designed for developers working on the Red Hat Enterprise Linux platform. It provides current versions of the **GNU Compiler Collection**, **GNU Debugger**, and other development, debugging, and performance monitoring tools. For a complete list of components, see the Red Hat Developer Toolset Components table in the *Red Hat Developer Toolset User Guide*.
Eclipse 4.6.1 [a]	*rh-eclipse46*	A release of the Eclipse *integrated development environment* that is based on the Eclipse Foundation's Neon release train. **Eclipse** was previously available as a Red Hat Developer Toolset component. This Software Collection depends on the *rh-java-common* component.
Perl 5.20.1	*rh-perl520*	A release of Perl, a high-level programming language that is commonly used for system administration utilities and web programming. The *rh-perl520* Software Collection provides additional utilities, scripts, and *database connectors for MySQL and PostgreSQL*. Also, it includes the **DateTime** Perl module and the **mod_perl** Apache httpd module, which is supported only with the *httpd24* Software Collection.
Perl 5.24.0	*rh-perl524*	A release of Perl, a high-level programming language that is commonly used for system administration utilities and web programming. The *rh-perl524* Software Collection provides additional utilities, scripts, and *database connectors for MySQL and PostgreSQL*. It includes the **DateTime** Perl module and the **mod_perl** Apache httpd module, which is supported only with the *httpd24* Software Collection. Additionally, it provides the **cpanm** utility for easy installation of CPAN modules.
PHP 5.6.25	*rh-php56*	A release of PHP with **PEAR 1.9.5** and enhanced language features including *constant expressions, variadic functions, arguments unpacking, and the interactive debugger*. The **memcache**, **mongo**, and **XDebug** extensions are also included.
PHP 7.0.10	*rh-php70*	A release of PHP 7 with PEAR 1.10, enhanced language features and *performance improvement*.
Python 2.7.8	*python27*	A release of Python 2.7 with a number of additional utilities. This Python version provides various new features and enhancements, including a new ordered dictionary type, faster I/O operations, and improved forward compatibility with Python 3. The *python27* Software Collections contains the *Python 2.7.8 interpreter*, a set of extension libraries useful for programming web applications and **mod_wsgi** (only supported with the *httpd24* Software Collection), MySQL and PostgreSQL database connectors, and **numpy** and **scipy**.

Component	Software Collection	Description
Python 3.4.2	*rh-python34*	A release of Python 3 with a number of additional utilities. This Software Collection gives developers on Red Hat Enterprise Linux access to Python 3 and allows them to benefit from various advantages and new features of this version. The *rh-python34* Software Collection contains *Python 3.4.2 interpreter*, a set of extension libraries useful for programming web applications and **mod_wsgi** (only supported with the *httpd24* Software Collection), PostgreSQL database connector, and **numpy** and **scipy**.
Python 3.5.1	*rh-python35*	The *rh-python35* Software Collection contains *Python 3.5.1 interpreter*, a set of extension libraries useful for programming web applications and **mod_wsgi** (only supported with the *httpd24* Software Collection), PostgreSQL database connector, and **numpy** and **scipy**.
Ruby 2.2.2	*rh-ruby22*	A release of Ruby 2.2. This version provides substantial *performance and reliability improvements, including incremental and symbol garbage collection* and many others, while maintaining source level backward compatibility with Ruby 2.0.0 and Ruby 1.9.3.
Ruby 2.3.1	*rh-ruby23*	A release of Ruby 2.3. This version introduces *a command-line option to freeze all string literals in the source files, a safe navigation operator, and multiple performance enhancements*, while maintaining source level backward compatibility with Ruby 2.2.2, Ruby 2.0.0, and Ruby 1.9.3.
Ruby on Rails 4.1.5	*rh-ror41*	A release of Ruby on Rails 4.1, a web application development framework written in the Ruby language. This version provides a number of new features including *Spring application preloader, config/secrets.yml, Action Pack variants, and Action Mailer previews*. This Software Collection is supported together with the *rh-ruby22* Collection.
Ruby on Rails 4.2.6	*rh-ror42*	A release of Ruby on Rails 4.2, the latest version of the web application framework written in the Ruby language. Highlights in this release include *Active Job, asynchronous mails, Adequate Record, Web Console, and foreign key support*. This Software Collection is supported together with the *rh-ruby23* and *rh-nodejs4* Collections.
MariaDB 10.0.26	*rh-mariadb100*	A release of MariaDB, *an alternative to MySQL* for users of Red Hat Enterprise Linux. For all practical purposes, MySQL is binary compatible with MariaDB and can be replaced with it without any data conversions. This version adds the PAM authentication plugin to MariaDB.

Component	Software Collection	Description
MariaDB 10.1.16	*rh-mariadb101*	A release of MariaDB, *an alternative to MySQL* for users of Red Hat Enterprise Linux. For all practical purposes, MySQL is binary compatible with MariaDB and can be replaced with it without any data conversions. This version adds the Galera Cluster support.
MongoDB 2.6.9	*rh-mongodb26*	A release of MongoDB, a cross-platform *document-oriented database system classified as a NoSQL database*. This Software Collection includes the *mongo-java-driver* package version 2.14.1.
MongoDB 3.2.10	*rh-mongodb32*	A release of MongoDB, a cross-platform *document-oriented database system classified as a NoSQL database*. This Software Collection includes the *mongo-java-driver* package version 3.2.1.
MongoDB 3.0.11 upgrade collection	*rh-mongodb30upg*	A limited version of **MongoDB 3.0** is available to provide an upgrade path from **MongoDB 2.6** to **MongoDB 3.2** for customers with existing MongoDB databases.
MySQL 5.6.34	*rh-mysql56*	A release of MySQL, which provides a number of new features and enhancements, including improved performance.
MySQL 5.7.16	*rh-mysql57*	A release of MySQL, which provides a number of new features and enhancements, including improved performance.
PostgreSQL 9.4.9	*rh-postgresql94*	A release of PostgreSQL, which provides a new data type to store JSON more efficiently and a new SQL command for changing configuration files, reduces lock strength for some commands, allows materialized views without blocking concurrent reads, supports logical decoding of WAL data to allow stream changes in a customizable format and enable background worker processes to be dynamically registered, started, and terminated.
PostgreSQL 9.5.4	*rh-postgresql95*	A release of PostgreSQL, which provides a number of enhancements, including *row-level security control,* introduces replication progress tracking, improves handling of large tables with high number of columns, and improves performance for sorting and multi-CPU machines.
Node.js 4.4.2	*rh-nodejs4*	A release of Node.js with **npm 2.15.1** and *support for the SPDY protocol version 3.1*. This Software Collection gives users of Red Hat Enterprise Linux access to this programming platform.
rh-nginx 1.8.1	*rh-nginx18*	A release of nginx, a web and proxy server with a focus on high concurrency, performance and low memory usage. This version introduces a number of new features, including *back-end SSL certificate verification, logging to syslog, thread pools support for offloading I/O requests, or hash load balancing method*.

Component	Software Collection	Description
Apache httpd 2.4.18	*httpd24*	A release of the Apache HTTP Server (httpd), including a high performance *event-based processing model, enhanced SSL module and FastCGI support*. The **mod_auth_kerb** module is also included.
Varnish Cache 4.0.3	*rh-varnish4*	A release of Varnish Cache, a *high-performance HTTP reverse proxy*. **Varnish Cache** stores files or fragments of files in memory that are used to reduce the response time and network bandwidth consumption on future equivalent requests.
Thermostat 1.6.4	*rh-thermostat16*	A release of Thermostat, a monitoring and instrumentation tool for the *OpenJDK HotSpot JVM*, with support for monitoring *multiple JVM instances*. This Software Collection depends on the *rh-mongodb32* and *rh-java-common* components.
Maven 3.3.9	*rh-maven33*	A release of Maven, a *software project management and comprehension tool* used primarily for Java projects. This version provides various enhancements, for example, *improved core extension mechanism*.
Passenger 4.0.50	*rh-passenger40*	A release of Phusion Passenger, a web and application server, designed to be fast, robust, and lightweight. It supports **Ruby** using the *ruby193*, *ruby200*, or *rh-ruby22* Software Collections together with **Ruby on Rails** using the *ror40* or *rh-ror41* Collections. It can also be used with **nginx 1.6** from the *nginx16* Software Collection and with **Apache httpd** from the *httpd24* Software Collection.
Git 2.9.3	*rh-git29*	A release of Git, a *distributed revision control system* with a decentralized architecture. As opposed to centralized version control systems with a client-server model, Git ensures that each working copy of a Git repository is its exact copy with complete revision history.
Redis 3.2.4	*rh-redis32*	A release of Redis 3.2, a *persistent key-value database*.
Common Java Packages 1.1	*rh-java-common*	This Software Collection provides *common Java libraries and tools* used by other collections. The *rh-java-common* Software Collection is required by the *devtoolset-4*, *devtoolset-3*, *rh-maven33*, *maven30*, *rh-mongodb32*, *rh-mongodb26*, *thermostat1*, *rh-thermostat16*, and *rh-eclipse46* components and it is not supposed to be installed directly by users.
V8 3.14.5.10	*v8314*	This Software Collection provides the *V8 JavaScript engine* and is supported only as a dependency for the *mongodb24*, *rh-mongodb26*, *rh-mongodb30upg*, *ruby193*, *ror40*, *rh-ror41*, and *nodejs010* Software Collections.

[a] This Software Collection is available only for Red Hat Enterprise Linux 7

Previously released Software Collections remain available in the same distribution channels. All currently available Software Collections are listed in the Table 1.2, “All Available Software Collections”.

See the Red Hat Software Collections Product Life Cycle document for information on the length of support for individual components. For detailed information regarding previously released components, refer to the Release Notes for earlier versions of Red Hat Software Collections.

Table 1.2. All Available Software Collections

Component	Software Collection	Availability
Components New in Red Hat Software Collections 2.3		
Red Hat Developer Toolset 6.0	*devtoolset-6*	RHEL6, RHEL7
Eclipse 4.6.1	*rh-eclipse46*	RHEL7
Git 2.9.3	*rh-git29*	RHEL6, RHEL7
Redis 3.2.4	*rh-redis32*	RHEL6, RHEL7
Perl 5.24.0	*rh-perl524*	RHEL6, RHEL7
PHP 7.0.10	*rh-php70*	RHEL6, RHEL7
MySQL 5.7.16	*rh-mysql57*	RHEL6, RHEL7
Thermostat 1.6.4	*rh-thermostat16*	RHEL6, RHEL7
Components Updated in Red Hat Software Collections 2.3		
Python 3.5.1	*rh-python35*	RHEL6, RHEL7
MongoDB 3.2.10	*rh-mongodb32*	RHEL6, RHEL7
Ruby 2.3.1	*rh-ruby23*	RHEL6, RHEL7
PHP 5.6.25	*rh-php56*	RHEL6, RHEL7
Common Java Packages 1.1	*rh-java-common*	RHEL6, RHEL7
Components Not Updated since Red Hat Software Collections 2.2		
MariaDB 10.1.16	*rh-mariadb101*	RHEL6, RHEL7
Maven 3.3.9	*rh-maven33*	RHEL6, [a] RHEL7
MongoDB 3.0.11 upgrade collection	*rh-mongodb30upg*	RHEL6, [a] RHEL7
Node.js 4.4.2	*rh-nodejs4*	RHEL6, RHEL7
PostgreSQL 9.5.4	*rh-postgresql95*	RHEL6, RHEL7
Ruby on Rails 4.2.6	*rh-ror42*	RHEL6, [a] RHEL7
Apache httpd 2.4.18	*httpd24*	RHEL6, RHEL7
Python 2.7.8	*python27*	RHEL6, RHEL7
MongoDB 2.6.9	*rh-mongodb26*	RHEL6, RHEL7
Thermostat 1.4.4	*thermostat1*	RHEL6, RHEL7
[a] This Software Collection has been made available for Red Hat Enterprise Linux 6 since Red Hat Software Collections 2.3.		
Components Not Updated since Red Hat Software Collections 2.1		
Varnish Cache 4.0.3	*rh-varnish4*	RHEL6, RHEL7
nginx 1.8.1	*rh-nginx18*	RHEL6, RHEL7
Node.js 0.10	*nodejs010*	RHEL6, RHEL7
Maven 3.0.5	*maven30*	RHEL6, RHEL7
V8 3.14.5.10	*v8314*	RHEL6, RHEL7
Components Not Updated since Red Hat Software Collections 2.0		
Perl 5.20.1	*rh-perl520*	RHEL6, RHEL7
Python 3.4.2	*rh-python34*	RHEL6, RHEL7
Ruby 2.2.2	*rh-ruby22*	RHEL6, RHEL7
Ruby on Rails 4.1.5	*rh-ror41*	RHEL6, RHEL7
MariaDB 10.0.26	*rh-mariadb100*	RHEL6, RHEL7

Components Not Updated since Red Hat Software Collections 2.0		
MySQL 5.6.34	*rh-mysql56*	RHEL6, RHEL7
PostgreSQL 9.4.9	*rh-postgresql94*	RHEL6, RHEL7
Passenger 4.0.50	*rh-passenger40*	RHEL6, RHEL7
PHP 5.4.40	*php54*	RHEL6, RHEL7
PHP 5.5.21	*php55*	RHEL6, RHEL7
nginx 1.6.2	*nginx16*	RHEL6, RHEL7
DevAssistant 0.9.3	*devassist09*	RHEL6, RHEL7
Components Not Updated since Red Hat Software Collections 1		
Git 1.9.4	*git19*	RHEL6, RHEL7
Perl 5.16.3	*perl516*	RHEL6, RHEL7
Python 3.3.2	*python33*	RHEL6, RHEL7
Ruby 1.9.3	*ruby193*	RHEL6, RHEL7
Ruby 2.0.0	*ruby200*	RHEL6, RHEL7
Ruby on Rails 4.0.2	*ror40*	RHEL6, RHEL7
MariaDB 5.5.53	*mariadb55*	RHEL6, RHEL7
MongoDB 2.4.9	*mongodb24*	RHEL6, RHEL7
MySQL 5.5.52	*mysql55*	RHEL6, RHEL7
PostgreSQL 9.2.18	*postgresql92*	RHEL6, RHEL7

RHEL6 — Red Hat Enterprise Linux 6

RHEL7 — Red Hat Enterprise Linux 7

The tables above list the latest versions available through asynchronous updates.

Note that Software Collections released in Red Hat Software Collections 2.0 and later include a **rh-** prefix in their names.

1.3. Changes in Red Hat Software Collections 2.3

1.3.1. Overview

New Software Collections

Red Hat Software Collections 2.3 adds these new Software Collections:

- *devtoolset-6* — see Section 1.3.2, “Changes in Red Hat Developer Toolset”
- *rh-eclipse46* — see Section 1.3.3, “Changes in Eclipse”
- *rh-git29* — see Section 1.3.4, “Changes in Git”
- *rh-redis32* — This new Software Collection provides **Redis 3.2.4**, an advanced key-value store. It is often referred to as a data structure server because keys can contain strings, hashes, lists, sets, and sorted sets. See the upstream documentation for details.
- *rh-perl524* — see Section 1.3.5, “Changes in Perl”
- *rh-php70* — see Section 1.3.6, “Changes in PHP”
- *rh-mysql57* — see Section 1.3.7, “Changes in MySQL”
- *rh-thermostat16* — see Section 1.3.8, “Changes in Thermostat”

Updated Software Collections

The following components have been updated in Red Hat Software Collections 2.3:

- *rh-python35* — see Section 1.3.9, “Changes in Python”
- *rh-mongodb32* — see Section 1.3.10, “Changes in MongoDB”
- *rh-ruby23* — see Section 1.3.11, “Changes in Ruby”
- *rh-php56* — see Section 1.3.6, “Changes in PHP”
- *rh-java-common* — see Section 1.3.12, “Changes in the Common Java Packages”

Software Collections Newly Available for Red Hat Enterprise Linux 6

The following Software Collections were released with Red Hat Software Collections 2.2 for Red Hat Enterprise Linux 7 and are now available also for Red Hat Enterprise Linux 6:

- *rh-maven33*
- *rh-mongodb30upg*
- *rh-ror42*

For detailed information on these components, see the Red Hat Software Collections 2.2 Release Notes.

The following Software Collections are also newly available for Red Hat Enterprise Linux 6 but have been updated with Red Hat Software Collections 2.3:

- *rh-python35*
- *rh-mongodb32*
- *rh-ruby23*

For recent changes, see below; for changes introduced in Red Hat Software Collections 2.2, refer to the Red Hat Software Collections 2.2 Release Notes.

Red Hat Software Collections Container Images

The following container images are new in Red Hat Software Collections 2.3:

- rhscl/devtoolset-6-toolchain-rhel7
- rhscl/devtoolset-6-perftools-rhel7
- rhscl/mysql-57-rhel7
- rhscl/perl-524-rhel7
- rhscl/php-70-rhel7
- rhscl/redis-32-rhel7
- rhscl/thermostat-16-agent-rhel7
- rhscl/thermostat-16-storage-rhel7

The following container images have been updated in Red Hat Software Collections 2.3:

- rhscl/mongodb-32-rhel7
- rhscl/php-56-rhel7
- rhscl/python-35-rhel7
- rhscl/ruby-23-rhel7

For detailed information regarding Red Hat Software Collections container images, see Section 3.4, “Red Hat Software Collections Container Images”.

1.3.2. Changes in Red Hat Developer Toolset

Red Hat Developer Toolset 6.0 includes a new component, **make 4.1**, a tool for controlling the generation of executables and other non-source files of a program from the program's source files.

The following components have been upgraded in Red Hat Developer Toolset 6.0 compared to the previous release of Red Hat Developer Toolset:

- **GCC** to version 6.2.1
- **binutils** to version 2.27
- **elfutils** to version 0.167
- **GDB** to version 7.12
- **strace** to version 4.12
- **SystemTap** to version 3.0
- **Valgrind** to version 3.12.0
- **Dyninst** to version 9.2.0

Red Hat Developer Toolset 6.0 introduces support for the following architectures on Red Hat Enterprise Linux 7:

- The 64-bit ARM architecture
- IBM POWER, big endian
- IBM POWER, little endian
- IBM z Systems

For detailed information on changes in Red Hat Developer Toolset 6.0, see Red Hat Developer Toolset User Guide.

1.3.3. Changes in Eclipse

The *rh-eclipse46* Software Collection, available for Red Hat Enterprise Linux 7, includes **Eclipse 4.6.1**, which is based on the Eclipse Foundation's Neon release train. This integrated development environment (IDE) was previously available as a part of Red Hat Developer Toolset.

This update contains a number of bug fixes and new features, including new plug-ins. Most notably, the **Webtools** plug-ins have been added, which provide support for editing file types, such as XML, HTML, and CSS, support for developing Java EE applications, web services, and support for developing Javascript applications.

Improvements to the IDE include:

- Startup times and support for GTK3 have been improved compared to the previous Red Hat Developer Toolset version.
- The **Eclipse Linux Tools** plug-in collection adds support for the **Docker Compose** tool, adds the **Dockerfile editor**, and provides improved support for container registries.
- The **Eclipse Platform** adds real support for word-wrapping and automatic saving of modified files in editors.
- The **Eclipse CDT** plug-in, which provides C and C++ development tooling, introduces improved debugging capabilities and improved New Project wizards.
- The **Eclipse JDT** plug-in, which contains Java development tools, provides improved support for null analysis and enhanced content assist and code-template features.
- The **Eclipse EGit** plug-in adds improved support for **Git** submodules and nested repositories, and improved **git-flow** and **Gerrit** support.
- The **Eclipse Python** plug-in provides improved **pyunit** and **pytest** integration.
- The **Eclipse Mylyn** plug-in contains significant improvements to its task list features.

For information on usage of the *rh-eclipse46* Software Collection, see Section 4.2, “Eclipse 4.6.1”.

1.3.4. Changes in Git

The new *rh-git29* Software Collection includes **Git 2.9.3**, which provides numerous bug fixes and new features compared to the *git19* Collection shipped in Red Hat Software Collections 1.

The following changes affect backward compatibility:

- Since **Git 2.0**, when using the **`git push [$there]`** command and not specifying what to push, the default semantics used is **`simple`**. Contrary to the previously used **`matching`** semantics, where all branches were pushed if branches of the same names existed as remote, **Git** now pushes only:
  - The current branch to the branch with the same name, and only when the current branch is set to integrate with that remote branch, if you are pushing to the same remote branch as you fetch from, or
  - The current branch to the branch with the same name, if you are pushing to a remote branch that is not where you usually fetch from.

  To preserve the previous behavior, set the **`push.default`** configuration variable to **`matching`**.
- When the **`git add -u`** and **`git add -A`** commands are run inside a subdirectory without specifying which paths to add, they now operate on the entire tree for consistency with **`git commit -a`** and other commands. Previously, these commands operated only on the current subdirectory. To limit the operation to the current directory, use the **`git add -u .`** or **`git add -A .`** commands.

  Additionally, the **`git add`** ***`path`*** command is now equal to **`git add -A`** ***`path`***, so **`git add`** ***`dir/`*** now tracks paths removed from the directory and records the removal. In previous versions of **Git**, the **`git add`** ***`path`*** command ignored such removals. To achieve the previous behavior, use **`git add --ignore-removal`** ***`path`***, which adds only added or modified paths in *path*.

- The **-q** option to the **git diff-files** command, which was used for ignoring deletion while comparing files, has been removed. To ignore deletion, use **git diff-files --diff-filter=d** instead.
- The **git request-pull** command, which generates a summary of pending changes, has been modified to reduce the probability of mistakes.
- The default prefix for the **git svn** command has changed since **Git 2.0**. Previously, **git svn** created its remote-tracking branches directly in the **refs/remotes/** directory, whereas now it places them in **refs/remotes/origin/**. To change this behavior, use the **--prefix** option.
- The output of the **git log --decorate** command and the **%d** format specifier used in the **--format=*string*** parameter to the **git log** family of commands has been changed. Previously, it listed the **HEAD** commit similarly to branches, for example:

  ```
  $ git log --decorate -1 master
  commit bdb0f6788fa5e3cacc4315e9ff318a27b2676ff4 (HEAD, master)
  ```

  This update changes the output slightly when **HEAD** refers to a branch, which is also shown in the output. The example from above is now displayed as:

  ```
  $ git log --decorate -1 master
  commit bdb0f6788fa5e3cacc4315e9ff318a27b2676ff4 (HEAD -> master)
  ```

- The phrasing of the **git branch** command has been updated to conform with the phrasing used by **git status** in case of a detached **HEAD** commit:
  - When **HEAD** is at the same commit as when it was originally detached, both commands now display:

    ```
    detached at commit
    ```

  - When **HEAD** has moved since it was originally detached, both commands now display:

    ```
    detached from commit
    ```

  Previously, the **git branch** command always displayed **from**.
- The high-level commands in the **git diff** and **git log** family now enable the detection of renaming by default. To disable this behavior, use the **diff.renames** configuration variable.
- Merging two branches that have no common ancestor with the **git merge** command is now disabled by default to prevent creating such an unusual merge by mistake.
- The output format of the **git log** command, which indents the commit log message by 4 spaces, now expands horizontal tabs in the log message by default. Use the **--no-expand-tabs** option to disable this behavior.
- The **git commit-tree** low-level command previously required the user to always sign its result when the user set the **commit.gpgsign** configuration variable. This behavior has been corrected. If a script that uses **git commit-tree** requires this behavior, pass the **-S** option as necessary.

Additionally, the remote-helper bridges to access data stored in **Mercurial** or **Bazaar** are not part of the *rh-git29* Software Collection.

For detailed changes, see the upstream release notes. See also the Git manual page for version 2.9.3.

1.3.5. Changes in Perl

The new *rh-perl524* Software Collection includes **Perl 5.24.0**, which provides a number of bug fixes and enhancements over the previously released *rh-perl520* Software Collection. Notably, it adds the *rh-perl524-perl-App-cpanminus* package, which contains the **cpanm** utility for getting, extracting, building, and installing modules from the Comprehensive Perl Archive Network (CPAN) repository.

1.3.6. Changes in PHP

PHP 7.0.10

The new *rh-php70* Software Collection includes **PHP 7.0.10**. This version provides numerous bug fixes and enhancements, for example, enhanced language features and an important performance improvement regarding speed and memory consumption. For detailed changes, see the upstream change log for version 7.0.10 and earlier.

PHP 5.6.25

The *rh-php56* Software Collection has been upgraded to version 5.6.25, which provides a number of bug fixes and enhancements over the version shipped with Red Hat Software Collections 2.2. For details, refer to the upstream change log for version 5.6.25 and earlier.

1.3.7. Changes in MySQL

The new *rh-mysql57* Software Collection includes **MySQL 5.7.16**, which provides numerous bug and security fixes and enhancements. Notably, after initialization, a random password is now set for the **root** user, which the server stores in a log file.

For detailed changes, see the upstream documentation.

1.3.8. Changes in Thermostat

The new *rh-thermostat16* Software Collection includes **Thermostat 1.6.4**. This version provides a number of bug fixes and enhancements over the *thermostat1* Collection.

New Features

- Stack trace profiler to highlight hotspots in the stack frame
- Statistics on compiler and compiled classes
- VM-specific Non-Uniform Memory Access (NUMA) information for NUMA-enabled systems
- Information on input and output done by Java virtual machines (JVMs)
- A new **local** command for CLI, which enables users to quickly run storage, agent, and GUI locally at once without doing any other setup or running any other commands
- Metaspace information from OpenJDK 8 is now recorded and displayed
- Tree map for profiler results
- A new **find-vm** command for CLI and shell to find VMs with extensive search criteria

- Support for the Shenandoah garbage collector in the **vm-gc** plug-in

Bug Fixes

- Improved support for the latest **MongoDB 3.2**
- Correct garbage collector time recorded for OpenJDK 8
- Instrumentation profiler no longer uses standard output and standard error from applications
- Fixed registration of thread back ends; intermittent failure could previously result in no VMs being monitored
- Errors are now prevented when there is no data to show
- Fixed setup of the classloader thread context setup for embedded Jetty

API addition

- Support for certain queries using just a VM ID

Experimental API additions

- Support for treemap-based graphics
- API for graphs (vertices and edges)

Note that the these experimental additions are not guaranteed to be backwards compatible in the future.

Efficiency improvements

- Support for cut, copy, and paste within the GUI
- Reduced query amounts for improved performance

For detailed changes, see the upstream change log. For information on usage, refer to the Thermostat User Guide.

1.3.9. Changes in Python

The *rh-python35* Software Collection, containing **Python 3.5.1**, has been updated to a later version, which provides a number of bug and security fixes and enhancements. Notably, the *rh-python35-python-PyMySQL* package has been added, which contains the PyMySQL library for interaction with MySQL and MariaDB databases from within Python.

The *rh-python35* Software Collection is now available also for Red Hat Enterprise Linux 6. For changes introduced in Red Hat Software Collections 2.2, refer to the Red Hat Software Collections 2.2 Release Notes.

1.3.10. Changes in MongoDB

The *rh-mongodb32* Software Collection has been updated to version 3.2.10, which provides a number of bug fixes and enhancements over the previous version. Notably, the *rh-mongodb32-mongo-cxx-driver* package has been added, which contains the shared library for the MongoDB legacy C++ Driver. See the Knowledgebase article about limitations of **mongo-cxx-driver** usage.

The *rh-mongodb32* Software Collection is now available also for Red Hat Enterprise Linux 6. In addition to **MongoDB 3.2**, the Collection contains packages that cannot be used from the base Red Hat Enterprise Linux 6 system, namely *rh-mongodb32-libunwind* and *rh-mongodb32-gpeftools*.

The *rh-mongodb30upg* Software Collection has also been included for Red Hat Enterprise Linux 6. Apart from **MongoDB 3.0.11**, providing the upgrade path from **MongoDB 2.6** to **MongoDB 3.2**, the Collection contains packages that cannot be used from the base Red Hat Enterprise Linux 6 system, namely *rh-mongodb30upg-boost*, *rh-mongodb30upg-libunwind*, and *rh-mongodb30upg-gpeftools*.

For changes introduced in Red Hat Software Collections 2.2, refer to the Red Hat Software Collections 2.2 Release Notes.

1.3.11. Changes in Ruby

The *rh-ruby23* Software Collection has been upgraded to version 2.3.1, which provides a number of bug fixes over the previous version.

The *rh-ruby23* Software Collection is now available also for Red Hat Enterprise Linux 6. For changes introduced in Red Hat Software Collections 2.2, refer to the Red Hat Software Collections 2.2 Release Notes.

1.3.12. Changes in the Common Java Packages

The *rh-java-common* Software Collection has been updated and extended to comply with the changes in the dependent components.

1.4. Compatibility Information

Red Hat Software Collections 2.3 is available for all supported releases of Red Hat Enterprise Linux 7 on AMD64 and Intel 64 architectures. Certain components are available also for all supported releases of Red Hat Enterprise Linux 6 on AMD64 and Intel 64 architectures.

For a full list of available components, see Table 1.2, “All Available Software Collections”.

1.5. Known Issues

`rh-ruby23` component

Determination of **`RubyGem`** installation paths is dependent on the order in which multiple Software Collections are enabled. The required order has been changed in **`Ruby 2.3.1`** shipped in Red Hat Software Collections 2.3 to support dependent Collections. As a consequence, **`RubyGem`** paths, which are used for **`gem`** installation during an RPM build, are invalid when the Software Collections are supplied in an incorrect order. For example, the build now fails if the RPM spec file contains **`scl enable rh-ror42 rh-nodejs4`**. To work around this problem, enable the *rh-ror42* Software Collection last, for example, **`scl enable rh-nodejs4 rh-ror42`**.

`rh-perl524`, `httpd24` components, BZ#1382706

CGI scripts cannot execute the **`perl`** command from the *rh-perl524* Software Collection. To work around this problem, set the **`LD_LIBRARY_PATH`** environment variable to **`/opt/rh/rh-perl524/root/usr/lib64`** in the CGI script.

`redis` component, BZ#1275246, BZ#1348471

When the Redis Sentinel service from the *rh-redis32* Software Collection is used, the functionality is restricted by SELinux policy if using Red Hat Enterprise Linux 7.2 or earlier. To work around this problem, switch the **redis** domain to permissive mode by running the following command as **root**:

```
semanage permissive -a redis_t
```

eclipse component

The **Eclipse Docker Tooling** introduces a **Dockerfile editor** with syntax highlighting and a basic command auto-completion. When the **Build Image Wizard** is open and the **Edit Dockerfile** button is pressed, the **Dockerfile editor** opens the file in a detached editor window. However, this window does not contain the **Cancel** and **Save** buttons. To work around this problem, press **Ctrl**+**S** to save your changes or right-click in the editor to launch a context menu, which offers the **Save** option. To cancel your changes, close the window.

eclipse component

On Red Hat Enterprise Linux 7.2, a bug in the **perf** tool, which is used to populate the **Perf Profile View** in **Eclipse**, causes some of the items in the view not to be properly linked to their respective positions in the Eclipse Editor. While the profiling works as expected, it is not possible to navigate to related positions in the Editor by clicking on parts of the **Perl Profile View**.

python27 component, BZ#1330489

The *python27-python-pymongo* package has been updated to version 3.2.1 in Red Hat Software Collections 2.3. Note that this version is not fully compatible with the previously shipped version 2.5.2. For details, see https://api.mongodb.org/python/current/changelog.html.

httpd24 component, BZ#1327548

The **mod_ssl** module does not support the Application-Layer Protocol Negotiation (ALPN) protocol on Red Hat Enterprise Linux. Consequently, clients that support upgrading TLS connections to HTTP/2.0 only using ALPN are limited to HTTP/1.1 support. Clients that support the NPN protocol in addition to ALPN (such as Mozilla Firefox) are able to successfully upgrade to HTTP/2.0.

httpd24 component, BZ#1329639

On Red Hat Enterprise Linux 7, running the **service httpd24-httpd configtest** command fails with an error message. To work around this problem, run the following command:

```
scl enable httpd24 'apachectl configtest'
```

rh-maven33 component

When the user has installed both the Red Hat Enterprise Linux system version of *maven-local* package and the *rh-maven33-maven-local package*, **XMvn**, a tool used for building Java RPM packages, run from the *rh-maven33* Software Collection tries to read the configuration file from the base system and fails. To work around this problem, uninstall the *maven-local* package from the base Red Hat Enterprise Linux system.

rh-nodejs4 component, BZ#1316626

The **/opt/rh/rh-nodejs4/root/usr/share/licenses/** directory is not owned by any package. Consequently, when the *rh-nodejs4* collection is uninstalled, this directory is not removed. To work around this problem, remove the directory manually after uninstalling *rh-nodejs4*.

rh-mysql57, rh-mysql56, rh-mariadb100, rh-mariadb101 components, BZ#1194611

The *rh-mysql57-mysql-server*, *rh-mysql56-mysql-server*, *rh-mariadb100-mariadb-server*, and *rh-mariadb101-mariadb-server* packages no longer provide the **test** database by default. Although this database is not created during initialization, the grant tables are prefilled with the same values as when **test** was created by default. As a consequence, upon a later creation of the **test** or **test_*** databases, these databases have less restricted access rights than is default for new databases.

Additionally, when running benchmarks, the **run-all-tests** script no longer works out of the box with example parameters. You need to create a test database before running the tests and specify the database name in the **--database** parameter. If the parameter is not specified, **test** is taken by default but you need to make sure the **test** database exist.

httpd24 component, BZ#1224763

When using the **mod_proxy_fcgi** module with FastCGI Process Manager (PHP-FPM), **httpd** uses port **8000** for the FastCGI protocol by default instead of the correct port **9000**. To work around this problem, specify the correct port explicitly in configuration.

rh-passenger40 component, BZ#1196555

When Passenger from the *rh-passenger40* Software Collection is run as a module for **httpd**, the functionality is restricted by SELinux policy. To work around this problem, switch the passenger domain to permissive mode by running the following command as **root**:

```
semanage permissive -a passenger_t
```

Standalone server and **nginx** integration are not affected by this issue.

mongodb24 component

The *mongodb24* Software Collection from Red Hat Software Collections 1.2 cannot be rebuilt with the *rh-java-common* and *maven30* Software Collections shipped with Red Hat Software Collections 2.3. Additionally, the *mongodb24-build* and *mongodb24-scldevel* packages cannot be installed with Red Hat Software Collections 2.3 due to unsatisfied requires on the *maven30-javapackages-tools* and *maven30-maven-local packages*. When the *mongodb24-scldevel* package is installed, broken dependencies are reported and the **yum --skip-broken** command skips too many packages. Users are advised to update to the *rh-mongodb26* Software Collection.

perl component

It is impossible to install more than one **mod_perl.so** library. As a consequence, it is not possible to use the **mod_perl** module from more than one **Perl** Software Collection.

nodejs010 component

Shared libraries provided by the *nodejs010* Software Collection, namely **libcares**, **libhttp_parser**, and **libuv**, are not properly prefixed with the Collection name. As a consequence, conflicts with the corresponding system libraries might occur.

nodejs-hawk component

The *nodejs-hawk* package uses an implementation of the SHA-1 and SHA-256 algorithms adopted from the CryptoJS project. In this release, the client-side JavaScript is obfuscated. The future fix will involve using crypto features directly from the CryptoJS library.

`postgresql` component

The *postgresql92*, *rh-postgresql94*, and *rh-postgresql95* packages for Red Hat Enterprise Linux 6 do not provide the **`sepgsql`** module as this feature requires installation of *libselinux* version 2.0.99, which is not available in Red Hat Enterprise Linux 6.

`httpd`, `mariadb`, `mongodb`, `mysql`, `nodejs`, `perl`, `php55`, `rh-php56`, `python`, `ruby`, `ror`, `thermostat`, and `v8314` components, BZ#1072319

When uninstalling the *httpd24*, *mariadb55*, *rh-mariadb100*, *mongodb24*, *rh-mongodb26*, *mysql55*, *rh-mysql56*, *nodejs010*, *perl516*, *rh-perl520*, *php55*, *rh-php56*, *python27*, *python33*, *rh-python34*, *ruby193*, *ruby200*, *rh-ruby22*, *ror40*, *rh-ror41*, *thermostat1*, or *v8314* packages, the order of uninstalling can be relevant due to ownership of dependent packages. As a consequence, some directories and files might not be removed properly and might remain on the system.

`mariadb`, `mysql`, `postgresql`, `mongodb` components

Red Hat Software Collections 2.3 contains the **MySQL 5.7**, **MySQL 5.6**, **MariaDB 10.0**, **MariaDB 10.1**, **PostgreSQL 9.4**, **PostgreSQL 9.5**, **MongoDB 2.6**, and **MongoDB 3.2** databases. The core Red Hat Enterprise Linux 6 provides earlier versions of the **MySQL** and **PostgreSQL** databases (client library and daemon). The core Red Hat Enterprise Linux 7 provides earlier versions of the **MariaDB** and **PostgreSQL** databases (client library and daemon). Client libraries are also used in database connectors for dynamic languages, libraries, and so on.

The client library packaged in the Red Hat Software Collections database packages in the **PostgreSQL** component is not supposed to be used, as it is included only for purposes of server utilities and the daemon. Users are instead expected to use the system library and the database connectors provided with the core system.

A protocol, which is used between the client library and the daemon, is stable across database versions, so, for example, using the **PostgreSQL 9.2** client library with the **PostgreSQL 9.4** or **9.5** daemon works as expected.

The core Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7 do not include the client library for **MongoDB**. In order to use this client library for your application, you should use the client library from Red Hat Software Collections and always use the **`scl enable ...`** call every time you run an application linked against this **MongoDB** client library.

`mariadb`, `mysql`, `mongodb` components

MariaDB, MySQL, and MongoDB do not make use of the **`/opt/provider/collection/root`** prefix when creating log files. Note that log files are saved in the **`/var/opt/provider/collection/log/`** directory, not in **`/opt/provider/collection/root/var/log/`**.

`httpd` component

Compiling external applications against the Apache Portable Runtime (APR) and APR-util libraries from the *httpd24* Software Collection is not supported. The LD_LIBRARY_PATH environment variable is not set in *httpd24* because it is not required by any application in this Software Collection.

`python27` component

In Red Hat Enterprise Linux 7, when the user tries to install the *python27-python-debuginfo* package, the **/usr/src/debug/Python-2.7.5/Modules/socketmodule.c** file conflicts with the corresponding file from the *python-debuginfo* package installed on the core system. Consequently, installation of the *python27-python-debuginfo* fails. To work around this problem, uninstall the *python-debuginfo* package and then install the *python27-python-debuginfo* package.

Other Notes

eclipse component

The Eclipse SWT graphical library on Red Hat Enterprise Linux 7 uses GTK 3.x. Eclipse **Dark Theme** is not yet fully stable on GTK 3.x, so this theme is considered a Technology Preview and not supported. For more information about Red Hat Technology Previews, see https://access.redhat.com/support/offerings/techpreview/.

rh-ruby22, rh-ruby23, rh-python34, rh-python35, rh-php56, rh-php70 components

Using Software Collections on a read-only NFS has several limitations.

- Ruby gems cannot be installed while the *rh-ruby22* or *rh-ruby23* Software Collection is on a read-only NFS. Consequently, for example, when the user tries to install the ab gem using the **gem install ab** command, an error message is displayed, for example:

```
ERROR:  While executing gem ... (Errno::EROFS)
    Read-only file system @ dir_s_mkdir - /opt/rh/rh-
ruby22/root/usr/local/share/gems
```

  The same problem occurs when the user tries to update or install gems from an external source by running the **bundle update** or **bundle install** commands.

- When installing Python packages on a read-only NFS using the Python Package Index (PyPI), running the **pip** command fails with an error message similar to this:

```
Read-only file system: '/opt/rh/rh-
python34/root/usr/lib/python3.4/site-packages/ipython-
3.1.0.dist-info'
```

- Installing packages from PHP Extension and Application Repository (PEAR) on a read-only NFS using the **pear** command fails with the error message:

```
Cannot install, php_dir for channel "pear.php.net" is not
writeable by the current user
```

This is an expected behavior.

httpd component

Language modules for Apache are supported only with the Red Hat Software Collections version of **Apache httpd** and not with the Red Hat Enterprise Linux system versions of **httpd**. For example, the **mod_wsgi** module from the *rh-python35* Collection can be used only with the *httpd24* Collection.

all components

Since Red Hat Software Collections 2.0, configuration files, variable data, and runtime data of individual Collections are stored in different directories than in previous versions of Red Hat Software Collections.

coreutils, util-linux, screen components

Some utilities, for example, **su**, **login**, or **screen**, do not export environment settings in all cases, which can lead to unexpected results. It is therefore recommended to use **sudo** instead of **su** and set the **env_keep** environment variable in the **/etc/sudoers** file. Alternatively, you can run commands in a reverse order; for example:

```
su -l postgres -c "scl enable rh-postgresql94 psql"
```

instead of

```
scl enable rh-postgresql94 bash
su -l postgres -c psql
```

When using tools like **screen** or **login**, you can use the following command to preserve the environment settings:

```
source /opt/rh/<collection_name>/enable
```

php54 component

Note that **Alternative PHP Cache (APC)** in Red Hat Software Collections is provided only for user data cache. For opcode cache, **Zend OPcache** is provided.

python component

When the user tries to install more than one *scldevel* package from the *python27*, *python33*, *rh-python34*, and *rh-python35* Software Collections, a transaction check error message is returned. This is an expected behavior because the user can install only one set of the macro files provided by the packages (**%scl_python**, **%scl_*prefix*_python**).

php component

When the user tries to install more than one *scldevel* package from the *php54*, *php55*, *rh-php56*, and *rh-php70* Software Collections, a transaction check error message is returned. This is an expected behavior because the user can install only one set of the macro files provided by the packages (**%scl_php**, **%scl_*prefix*_php**).

ruby component

When the user tries to install more than one *scldevel* package from the *ruby193*, *ruby200*, *rh-ruby22*, and *rh-ruby23* Software Collections, a transaction check error message is returned. This is an expected behavior because the user can install only one set of the macro files provided by the packages (**%scl_ruby**, **%scl_*prefix*_ruby**).

perl component

When the user tries to install more than one *scldevel* package from the *perl516*, *rh-perl520*, and *rh-perl524* Software Collections, a transaction check error message is returned. This is an expected behavior because the user can install only one set of the macro files provided by the packages (**%scl_perl**, **%scl_*prefix*_perl**).

nginx component

When the user tries to install more than one *scldevel* package from the *nginx16* and *rh-nginx18* Software Collections, a transaction check error message is returned. This is an expected behavior because the user can install only one set of the macro files provided by the packages (**%scl_nginx**, **%scl_*prefix*_nginx**).

nodejs component

When installing the *nodejs010* Software Collection, *nodejs010* installs **GCC** in the base Red Hat Enterprise Linux system as a dependency, unless the *gcc* packages are already installed.

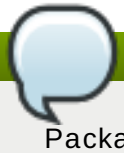
Chapter 2. Installation

This chapter describes in detail how to get access to the content set, install Red Hat Software Collections 2.3 on the system, and rebuild Red Hat Software Collections.

2.1. Getting Access to Red Hat Software Collections

The Red Hat Software Collections content set is available to customers with Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7 subscriptions listed at https://access.redhat.com/solutions/472793. Depending on the subscription management service with which you registered your Red Hat Enterprise Linux system, you can either enable Red Hat Software Collections by using Red Hat Subscription Management, or by using RHN Classic. For detailed instructions on how to enable Red Hat Software Collections using RHN Classic or Red Hat Subscription Management, see the respective section below. For information on how to register your system with one of these subscription management services, see Using and Configuring Red Hat Subscription Manager.

Since Red Hat Software Collections 2.2, the Red Hat Software Collections and Red Hat Developer Toolset content is available also in the ISO format at https://access.redhat.com/downloads, specifically for Server and Workstation. Note that packages that require the **Optional** channel, which are listed in Section 2.1.3, "Packages from the Optional Channel", cannot be installed from the ISO image.



Note

Packages that require the **Optional** channel cannot be installed from the ISO image. A list of packages that require enabling of the **Optional** channel is provided in Section 2.1.3, "Packages from the Optional Channel".

Beta content is unavailable in the ISO format.

2.1.1. Using Red Hat Subscription Management

If your system is registered with Red Hat Subscription Management, complete the following steps to attach the subscription that provides access to the repository for Red Hat Software Collections and enable the repository:

1. Display a list of all subscriptions that are available for your system and determine the pool ID of a subscription that provides Red Hat Software Collections. To do so, type the following at a shell prompt as **root**:

   ```
   subscription-manager list --available
   ```

   For each available subscription, this command displays its name, unique identifier, expiration date, and other details related to it. The pool ID is listed on a line beginning with **Pool Id**.

2. Attach the appropriate subscription to your system by running the following command as **root**:

   ```
   subscription-manager attach --pool=pool_id
   ```

Replace *pool_id* with the pool ID you determined in the previous step. To verify the list of subscriptions your system has currently attached, type as **root**:

```
subscription-manager list --consumed
```

3. Display the list of available Yum list repositories to retrieve repository metadata and determine the exact name of the Red Hat Software Collections repositories. As **root**, type:

```
subscription-manager repos --list
```

Or alternatively, run **yum repolist all** for a brief list.

The repository names depend on the specific version of Red Hat Enterprise Linux you are using and are in the following format:

```
rhel-variant-rhscl-6-rpms
rhel-variant-rhscl-6-debug-rpms
rhel-variant-rhscl-6-source-rpms

rhel-server-rhscl-6-eus-rpms
rhel-server-rhscl-6-eus-source-rpms
rhel-server-rhscl-6-eus-debug-rpms

rhel-variant-rhscl-7-rpms
rhel-variant-rhscl-7-debug-rpms
rhel-variant-rhscl-7-source-rpms

rhel-server-rhscl-7-eus-rpms
rhel-server-rhscl-7-eus-source-rpms
rhel-server-rhscl-7-eus-debug-rpms
```

Replace *variant* with the Red Hat Enterprise Linux system variant, that is, **server** or **workstation**. Note that Red Hat Software Collections is supported neither on the **Client** nor on the **ComputeNode** variant.

4. Enable the appropriate repository by running the following command as **root**:

```
subscription-manager repos --enable repository
```

Once the subscription is attached to the system, you can install Red Hat Software Collections as described in Section 2.2, “Installing Red Hat Software Collections”. For more information on how to register your system using Red Hat Subscription Management and associate it with subscriptions, see Using and Configuring Red Hat Subscription Manager.

2.1.2. Using RHN Classic

If your system is registered with RHN Classic, complete the following steps to subscribe to Red Hat Software Collections:

1. Display a list of all channels that are available to you and determine the exact name of the Red Hat Software Collections channel. To do so, type the following at a shell prompt as **root**:

```
rhn-channel --available-channels
```

The name of the channel depends on the specific version of Red Hat Enterprise Linux you are using and is in the following format, where *variant* is the Red Hat Enterprise Linux system variant (**server** or **workstation**):

```
rhel-x86_64-variant-6-rhscl-1

rhel-x86_64-server-6.5.z-rhscl-1
rhel-x86_64-server-6.6.z-rhscl-1

rhel-x86_64-variant-7-rhscl-1

rhel-x86_64-server-7.1.eus-rhscl-1
```

Red Hat Enterprise Linux 7 channels are accessible only through Red Hat Satellite instances.

Note

Red Hat Software Collections 2.x are distributed in the same channels as Red Hat Software Collections 1.x.

2. Subscribe the system to the Red Hat Software Collections channel by running the following command as **root**:

```
rhn-channel --add --channel=channel_name
```

Replace *channel_name* with the name you determined in the previous step.

3. Verify the list of channels you are subscribed to. As **root**, type:

```
rhn-channel --list
```

When the system is subscribed, you can install Red Hat Software Collections as described in Section 2.2, “Installing Red Hat Software Collections”. For more information on how to register your system with RHN Classic, see Using and Configuring Red Hat Subscription Manager.

2.1.3. Packages from the Optional Channel

Some of the Red Hat Software Collections 2.3 packages require the **Optional** channel to be enabled in order to complete the full installation of these packages. For detailed instructions on how to subscribe your system to this channel, see the relevant Knowledgebase articles on Red Hat Customer Portal: https://access.redhat.com/solutions/392003 for Red Hat Subscription Management or https://access.redhat.com/solutions/70019 if your system is registered with RHN Classic.

Packages from Software Collections for Red Hat Enterprise Linux 6 that require the **Optional** channel to be enabled are listed in the following table.

Table 2.1. Packages Requiring Enabling of the Optional Channel in Red Hat Enterprise Linux 6

Package from a Software Collection	Required Package from the Optional Channel
devtoolset-4-dyninst-testsuite	glibc-static

Package from a Software Collection	Required Package from the Optional Channel
devtoolset-4-elfutils-devel	xz-devel
devtoolset-4-gcc-plugin-devel	mpfr, mpfr-devel
devtoolset-4-libgccjit	mpfr
devtoolset-6-dyninst-testsuite	glibc-static
devtoolset-6-elfutils-devel	xz-devel
devtoolset-6-gcc-plugin-devel	mpfr, mpfr-devel
devtoolset-6-libgccjit	mpfr
git19-git-cvs	cvsps
git19-git-svn	perl-YAML, subversion-perl
git19-perl-Git-SVN	perl-YAML, subversion-perl
mariadb55-mariadb-bench	perl-GD
mysql55-mysql-bench	perl-GD
php54-php-imap	libc-client
php54-php-recode	recode
php55-php-imap	libc-client
php55-php-recode	recode
rh-git29-git-cvs	cvsps
rh-git29-git-email	perl-Net-SMTP-SSL
rh-git29-perl-Git-SVN	perl-YAML, subversion-perl
rh-mariadb100-mariadb-bench	perl-GD
rh-mariadb101-boost-devel	libicu-devel
rh-mariadb101-boost-examples	libicu-devel
rh-mariadb101-boost-static	libicu-devel
rh-mariadb101-mariadb-bench	perl-GD
rh-mongodb30upg-boost-devel	libicu-devel
rh-mongodb30upg-boost-examples	libicu-devel
rh-mongodb30upg-boost-static	libicu-devel
rh-mongodb30upg-yaml-cpp-devel	libicu-devel
rh-mongodb32-boost-devel	libicu-devel
rh-mongodb32-boost-examples	libicu-devel
rh-mongodb32-boost-static	libicu-devel
rh-mongodb32-yaml-cpp-devel	libicu-devel
rh-mysql56-mysql-bench	perl-GD
rh-php56-php-imap	libc-client
rh-php56-php-recode	recode
rh-php70-php-imap	libc-client
rh-php70-php-recode	recode

Software Collections packages that require the **`Optional`** channel in Red Hat Enterprise Linux 7 are listed in the table below.

Table 2.2. Packages Requiring Enabling of the Optional Channel in Red Hat Enterprise Linux 7

Package from a Software Collection	Required Package from the Optional Channel
devtoolset-6-dyninst-testsuite	glibc-static
devtoolset-6-gcc-plugin-devel	libmpc-devel
git19-git-cvs	cvsps
git19-git-svn	subversion-perl
git19-perl-Git-SVN	subversion-perl
httpd24-mod_ldap	apr-util-ldap
nodejs010	c-ares-devel
nodejs010-node-gyp	c-ares-devel
nodejs010-nodejs-columnify	c-ares-devel
nodejs010-nodejs-devel	c-ares-devel
nodejs010-nodejs-npmconf	c-ares-devel
nodejs010-nodejs-wcwidth	c-ares-devel
nodejs010-npm	c-ares-devel
rh-eclipse46	ruby-doc
rh-eclipse46-eclipse-dltk-ruby	ruby-doc
rh-eclipse46-eclipse-dltk-sdk	ruby-doc
rh-eclipse46-eclipse-dltk-tests	ruby-doc
rh-git29-git-cvs	cvsps
rh-git29-perl-Git-SVN	subversion-perl
rh-perl520-perl-Pod-Perldoc	groff

Note that packages from the **`Optional`** channel are not supported. For details, see the Knowledgebase article https://access.redhat.com/articles/1150793.

2.2. Installing Red Hat Software Collections

Red Hat Software Collections is distributed as a collection of RPM packages that can be installed, updated, and uninstalled by using the standard package management tools included in Red Hat Enterprise Linux. Note that a valid subscription is required to install Red Hat Software Collections on your system. For detailed instructions on how to associate your system with an appropriate subscription and get access to Red Hat Software Collections, see Section 2.1, “Getting Access to Red Hat Software Collections”.

Use of Red Hat Software Collections 2.3 requires the removal of any earlier pre-release versions, including Beta releases. If you have installed any previous version of Red Hat Software Collections 2.3, uninstall it from your system and install the new version as described in the Section 2.3, “Uninstalling Red Hat Software Collections” and Section 2.2.1, “Installing Individual Software Collections” sections.

The in-place upgrade from Red Hat Enterprise Linux 6 to Red Hat Enterprise Linux 7 is not supported by Red Hat Software Collections. As a consequence, the installed Software Collections might not work correctly after the upgrade. If you want to upgrade from Red Hat Enterprise Linux 6 to Red Hat Enterprise Linux 7, it is strongly recommended to remove all Red Hat Software Collections packages, perform the in-place upgrade, update the Red Hat Software Collections repository, and install the Software Collections packages again. It is advisable to back up all data before upgrading.

2.2.1. Installing Individual Software Collections

To install any of the Software Collections that are listed in Table 1.1, “Red Hat Software Collections 2.3 Components”, install the corresponding meta package by typing the following at a shell prompt as **root**:

```
yum install software_collection...
```

Replace *software_collection* with a space-separated list of Software Collections you want to install. For example, to install *php54* and *rh-mariadb100*, type as **root**:

```
~]# yum install rh-php56 rh-mariadb100
```

This installs the main meta package for the selected Software Collection and a set of required packages as its dependencies. For information on how to install additional packages such as additional modules, see Section 2.2.2, “Installing Optional Packages”.

2.2.2. Installing Optional Packages

Each component of Red Hat Software Collections is distributed with a number of optional packages that are not installed by default. To list all packages that are part of a certain Software Collection but are not installed on your system, type the following at a shell prompt:

```
yum list available software_collection-\*
```

To install any of these optional packages, type as **root**:

```
yum install package_name...
```

Replace *package_name* with a space-separated list of packages that you want to install. For example, to install the *rh-perl520-perl-CPAN* and *rh-perl520-perl-Archive-Tar*, type:

```
~]# yum install rh-perl524-perl-CPAN rh-perl524-perl-Archive-Tar
```

2.2.3. Installing Debugging Information

To install debugging information for any of the Red Hat Software Collections packages, make sure that the *yum-utils* package is installed and type the following command as **root**:

```
debuginfo-install package_name
```

For example, to install debugging information for the *rh-ruby22-ruby* package, type:

```
~]# debuginfo-install rh-ruby22-ruby
```

Note that in order to use this command, you need to have access to the repository with these packages. If your system is registered with Red Hat Subscription Management, enable the **rhel-*variant*-rhscl-6-debug-rpms** or **rhel-*variant*-rhscl-7-debug-rpms** repository as described in Section 2.1.1, “Using Red Hat Subscription Management”. If your system is registered with RHN Classic, subscribe the system to the **rhel-x86_64-*variant*-6-rhscl-1-debuginfo** or **rhel-x86_64-*variant*-7-rhscl-1-debuginfo** channel as described in Section 2.1.2, “Using RHN Classic”. For more information on how to get access to debuginfo packages, see https://access.redhat.com/solutions/9907.

2.3. Uninstalling Red Hat Software Collections

To uninstall any of the Software Collections components, type the following at a shell prompt as **root**:

```
yum remove software_collection\*
```

Replace *software_collection* with the Software Collection component you want to uninstall.

Note that uninstallation of the packages provided by Red Hat Software Collections does not affect the Red Hat Enterprise Linux system versions of these tools.

2.4. Rebuilding Red Hat Software Collections

<collection>-build packages are not provided by default. If you wish to rebuild a collection and do not want or cannot use the **rpmbuild --define 'scl foo'** command, you first need to rebuild the metapackage, which provides the *<collection>-build* package.

Note that existing collections should not be rebuilt with different content. To add new packages into an existing collection, you need to create a new collection containing the new packages and make it dependent on packages from the original collection. The original collection has to be used without changes.

For detailed information on building Software Collections, refer to the Red Hat Software Collections Packaging Guide.

Chapter 3. Usage

This chapter describes the necessary steps for rebuilding and using Red Hat Software Collections 2.3, and deploying applications that use Red Hat Software Collections.

3.1. Using Red Hat Software Collections

3.1.1. Running an Executable from a Software Collection

To run an executable from a particular Software Collection, type the following command at a shell prompt:

```
scl enable software_collection... 'command...'
```

Or, alternatively, use the following command:

```
scl enable software_collection... -- command...
```

Replace *software_collection* with a space-separated list of Software Collections you want to use and *command* with the command you want to run. For example, to execute a Perl program stored in a file named **hello.pl** with the Perl interpreter from the *perl516* Software Collection, type:

```
~]$ scl enable rh-perl524 'perl hello.pl'
Hello, World!
```

You can execute any command using the **scl** utility, causing it to be run with the executables from a selected Software Collection in preference to their possible Red Hat Enterprise Linux system equivalents. For a complete list of Software Collections that are distributed with Red Hat Software Collections, see Table 1.1, “Red Hat Software Collections 2.3 Components”.

3.1.2. Running a Shell Session with a Software Collection as Default

To start a new shell session with executables from a selected Software Collection in preference to their Red Hat Enterprise Linux equivalents, type the following at a shell prompt:

```
scl enable software_collection... bash
```

Replace *software_collection* with a space-separated list of Software Collections you want to use. For example, to start a new shell session with the *python27* and *rh-postgresql95* Software Collections as default, type:

```
~]$ scl enable python27 rh-postgresql95 bash
```

The list of Software Collections that are enabled in the current session is stored in the **$X_SCLS** environment variable, for instance:

```
~]$ echo $X_SCLS
python27 rh-postgresql95
```

For a complete list of Software Collections that are distributed with Red Hat Software Collections, see Table 1.1, “Red Hat Software Collections 2.3 Components”.

3.1.3. Running a System Service from a Software Collection

Software Collections that include system services install corresponding init scripts in the **/etc/rc.d/init.d/** directory. To start such a service in the current session, type the following at a shell prompt as **root**:

```
service software_collection-service_name start
```

Replace *software_collection* with the name of the Software Collection and *service_name* with the name of the service you want to start. To configure this service to start automatically at boot time, type the following command as **root**:

```
chkconfig software_collection-service_name on
```

For example, to start the **postgresql** service from the *rh-postgresql95* Software Collection and enable it in runlevels 2, 3, 4, and 5, type as **root**:

```
~]# service rh-postgresql95-postgresql start
Starting rh-postgresql95-postgresql service:                [  OK  ]
~]# chkconfig rh-postgresql95-postgresql on
```

For more information on how to manage system services in Red Hat Enterprise Linux 6, refer to the Red Hat Enterprise Linux 6 Deployment Guide. For a complete list of Software Collections that are distributed with Red Hat Software Collections, see Table 1.1, “Red Hat Software Collections 2.3 Components”.

3.2. Accessing a Manual Page from a Software Collection

Every Software Collection contains a general manual page that describes the content of this component. Each manual page has the same name as the component and it is located in the **/opt/rh** directory.

To read a manual page for a Software Collection, type the following command:

```
scl enable software_collection 'man software_collection'
```

Replace *software_collection* with the particular Red Hat Software Collections component. For example, to display the manual page for *rh-mariadb101*, type:

```
~]$ scl enable rh-mariadb101 "man rh-mariadb101"
```

3.3. Deploying Applications That Use Red Hat Software Collections

In general, you can use one of the following two approaches to deploy an application that depends on a component from Red Hat Software Collections in production:

- Install all required Software Collections and packages manually and then deploy your application, or
- Create a new Software Collection for your application and specify all required Software Collections and other packages as dependencies.

For more information on how to manually install individual Red Hat Software Collections

components, see Section 2.2, “Installing Red Hat Software Collections”. For further details on how to use Red Hat Software Collections, see Section 3.1, “Using Red Hat Software Collections”. For a detailed explanation of how to create a custom Software Collection or extend an existing one, read the Red Hat Software Collections Packaging Guide.

3.4. Red Hat Software Collections Container Images

Container images based on Red Hat Software Collections have been available since Red Hat Software Collections 2.0. The container images include applications, daemons, and databases. The images can be run on Red Hat Enterprise Linux 7 Server and Red Hat Enterprise Linux Atomic Host. For information about their usage, see the Knowledgebase article at https://access.redhat.com/articles/1752723. For details about images based on the Red Hat Developer Toolset components, refer to the Red Hat Developer Toolset User Guide.

The following container images are new in Red Hat Software Collections 2.3:

- rhscl/devtoolset-6-toolchain-rhel7
- rhscl/devtoolset-6-perftools-docker
- rhscl/mysql-57-rhel7
- rhscl/perl-524-rhel7
- rhscl/php-70-rhel7
- rhscl/redis-32-rhel7
- rhscl/thermostat-16-agent-rhel7
- rhscl/thermostat-16-storage-rhel7

The following container images have been updated in Red Hat Software Collections 2.3:

- rhscl/mongodb-32-rhel7
- rhscl/php-56-rhel7
- rhscl/python-35-rhel7
- rhscl/ruby-23-rhel7

The following container images are based on Red Hat Software Collections 2.2:

- rhscl/devtoolset-4-perftools-docker
- rhscl/mariadb-101-rhel7
- rhscl/nginx-18-rhel7
- rhscl/nodejs-4-rhel7
- rhscl/postgresql-95-rhel7
- rhscl/ror-42-rhel7
- rhscl/thermostat-1-agent-rhel7
- rhscl/varnish-4-rhel7

- rhscl/devtoolset-4-toolchain-rhel7
- rhscl/httpd-24-rhel7
- rhscl/python-27-rhel7

The following container images are based on Red Hat Software Collections 2.0:

- rhscl/mariadb-100-rhel7
- rhscl/mongodb-26-rhel7
- rhscl/mysql-56-rhel7
- rhscl/nginx-16-rhel7
- rhscl/passenger-40-rhel7
- rhscl/perl-520-rhel7
- rhscl/postgresql-94-rhel7
- rhscl/python-34-rhel7
- rhscl/ror-41-rhel7
- rhscl/ruby-22-rhel7
- rhscl/s2i-base-rhel7

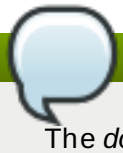
3.5. Dockerfiles for Red Hat Software Collections

Red Hat Software Collections is shipped with Dockerfiles for the following Software Collections:

- *httpd24*
- *mariadb55*
- *mongodb24*
- *mysql55*
- *nginx16*
- *nodejs010*
- *perl516*
- *php54*
- *php55*
- *postgresql92*
- *python27*
- *python33*
- *rh-mariadb100*
- *rh-mongodb26*

- *rh-mysql56*
- *rh-passenger40*
- *rh-perl520*
- *rh-php56*
- *rh-postgresql94*
- *rh-python34*
- *rh-ror41*
- *rh-ruby22*
- *ror40*
- *ruby193*
- *ruby200*

The Dockerfiles are included in the *rhscl-dockerfiles* package distributed with Red Hat Software Collections. Dockerfiles are text files that define how a Docker image is created. Note that the *rhscl-dockerfiles* package has not been updated since Red Hat Software Collections 2.0.



Note

The *docker* package, which contains the **Docker** daemon, command line tool, and other necessary components for building and using docker-formatted container images, is currently only available for the Server variant of the Red Hat Enterprise Linux 7 product. Red Hat Software Collections Dockerfiles are distributed for Red Hat Enterprise Linux 6 as well, but the images built using them can only be deployed on Red Hat Enterprise Linux 7 Server.

Each Dockerfile creates a minimal Docker image from Red Hat Enterprise Linux 6 or Red Hat Enterprise Linux 7 plus the Software Collection. Each Dockerfile will create an image which:

- Installs the basic set of packages from each Software Collection,
- Exposes some TCP ports; for example, port **80** and **443** for the *httpd24* collection.

The Dockerfiles are provided as examples, using which customers can build more complex containers.

Dockerfiles are available also for previously released Software Collections. For detailed information about them, refer to the Red Hat Software Collections documentation and the Red Hat Software Collections Product Life Cycle document.

3.5.1. Installation and Usage

To install the *rhscl-dockerfiles* package, type the following command as **root**:

```
yum install rhscl-dockerfiles
```

Use these Dockerfiles to create Docker images for the covered Software Collections.

For more information about building an image from a Dockerfile, see the Get Started with Docker Formatted Container Images chapter in the *Getting Started with Containers* documentation.

3.5.2. Deploying Software Collections Dependent on the Red Hat Software Collections Docker Images

You can use a Red Hat Software Collections Docker image as a base image and create your own containerized Software Collection on top of it as a separate image.

For more information about creating a new Docker image, see the Creating Docker Images section in the *Getting Started with Containers* documentation.

Chapter 4. Specifics of Individual Software Collections

This chapter is focused on the specifics of certain Software Collections and provides additional details concerning these components.

4.1. Red Hat Developer Toolset

Red Hat Developer Toolset is designed for developers working on the Red Hat Enterprise Linux platform. Red Hat Developer Toolset provides current versions of the **GNU Compiler Collection**, **GNU Debugger**, and other development, debugging, and performance monitoring tools. Similarly to other Software Collections, an additional set of tools is installed into the **/opt/** directory. These tools are enabled by the user on demand using the supplied **scl** utility. Similarly to other Software Collections, these do not replace the Red Hat Enterprise Linux system versions of these tools, nor will they be used in preference to those system versions unless explicitly invoked using the **scl** utility.

For an overview of features, refer to the Main Features section of the *Red Hat Developer Toolset Release Notes*.

For a complete list of components, see the Red Hat Developer Toolset Components table in the *Red Hat Developer Toolset User Guide*.

Note that since Red Hat Developer Toolset 3.1, Red Hat Developer Toolset requires the *rh-java-common* Software Collection.

4.2. Eclipse 4.6.1

The *rh-eclipse46* Software Collection, available for Red Hat Enterprise Linux 7, includes **Eclipse 4.6.1**, which is based on the Eclipse Foundation's Neon release train. This integrated development environment was previously available as a part of Red Hat Developer Toolset. Note that the *rh-eclipse46* Software Collection requires the *rh-java-common* Collection.

Eclipse is a powerful development environment that provides tools for each phase of the development process. It integrates a variety of disparate tools into a unified environment to create a rich development experience, provides a fully configurable user interface, and features a pluggable architecture that allows for an extension in a variety of ways. For instance, the **Valgrind** plug-in allows programmers to perform memory profiling, otherwise performed on the command line, through the **Eclipse** user interface.

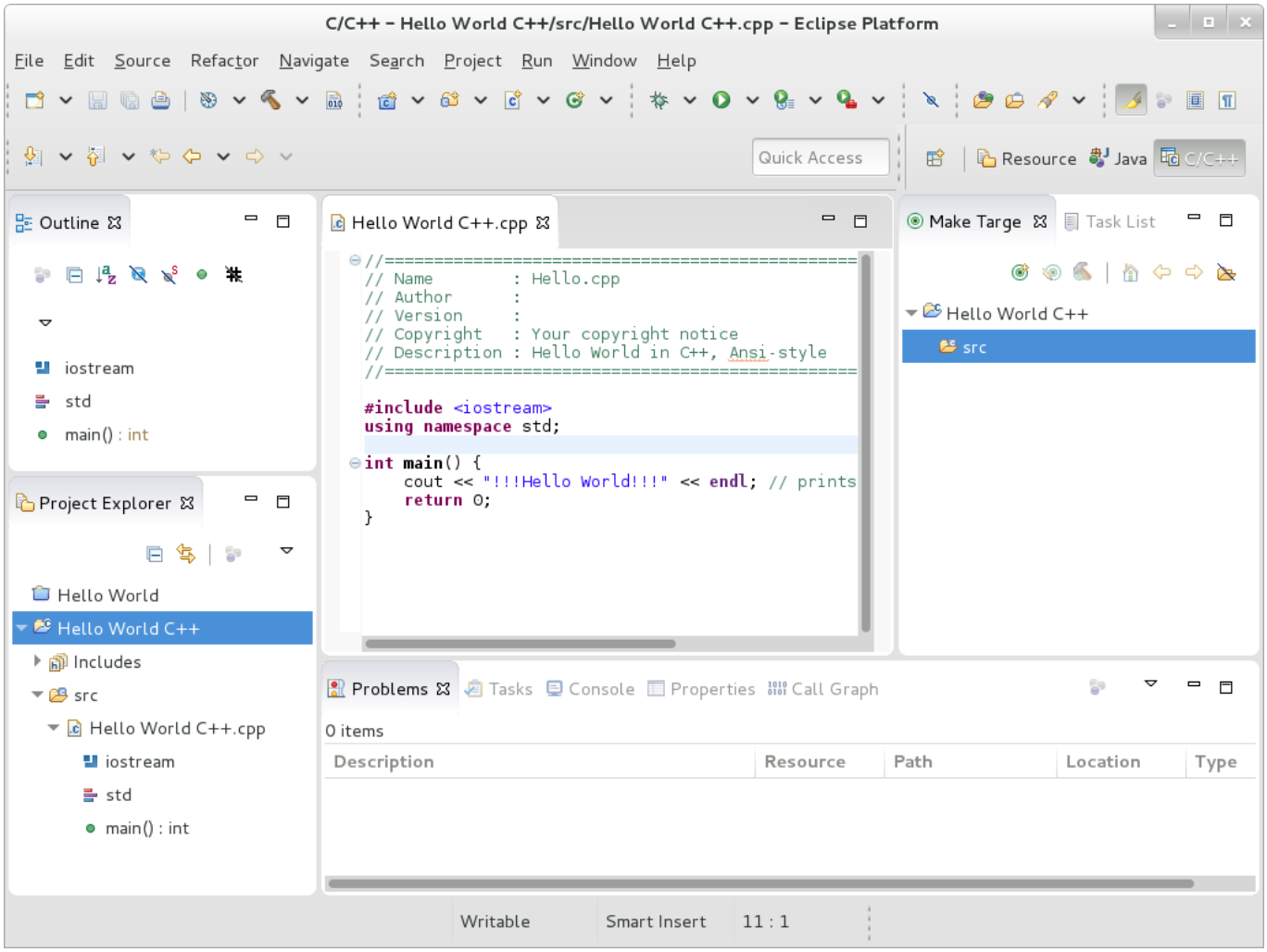


Figure 4.1. Sample Eclipse Session

Eclipse provides a graphical development environment alternative to traditional interaction with command line tools and as such, it is a welcome alternative to developers who do not want to use the command line interface. The traditional, mostly command line-based Linux tools suite (such as **gcc** or **gdb**) and **Eclipse** offer two distinct approaches to programming.

Note that if you intend to develop applications for Red Hat JBoss Middleware or require support for OpenShift Tools, it is recommended that you use Red Hat JBoss Developer Studio.

Table 4.1. Eclipse Components Included in the *rh-eclipse46* Software Collection

Package	Description
rh-eclipse46-eclipse-cdt	The C/C++ Development Tooling (CDT), which provides features and plug-ins for development in C and C++.
rh-eclipse46-eclipse-changelog	The ChangeLog plug-in, which allows you to create and maintain changelog files.
rh-eclipse46-eclipse-egit	EGit, a team provider for **Eclipse** that provides features and plug-ins for interaction with Git repositories.
rh-eclipse46-eclipse-emf	The **Eclipse** Modeling Framework (EMF), which allows you to build applications based on a structured data model.
rh-eclipse46-eclipse-epp-logging	The Eclipse error reporting tool.
rh-eclipse46-eclipse-gcov	The GCov plug-in, which integrates the **GCov** test coverage program with **Eclipse**.

Package	Description
rh-eclipse46-eclipse-gef	The Graphical Editing Framework (GEF), which allows you to create a rich graphical editor from an existing application model.
rh-eclipse46-eclipse-gprof	The Gprof plug-in, which integrates the **Gprof** performance analysis utility with **Eclipse**.
rh-eclipse46-eclipse-jdt	The **Eclipse** Java development tools (JDT) plug-in.
rh-eclipse46-eclipse-jgit	JGit, a Java implementation of the **Git** revision control system.
rh-eclipse46-eclipse-manpage	The Man Page plug-in, which allows you to view manual pages in **Eclipse**.
rh-eclipse46-eclipse-mpc	The **Eclipse** Marketplace Client.
rh-eclipse46-eclipse-mylyn	Mylyn, a task management system for **Eclipse**.
rh-eclipse46-eclipse-oprofile	The OProfile plug-in, which integrates **OProfile** with **Eclipse**.
rh-eclipse46-eclipse-pde	The Plugin Development Environment for developing **Eclipse** plugins.
rh-eclipse46-eclipse-perf	The Perf plug-in, which integrates the **perf** tool with **Eclipse**.
rh-eclipse46-eclipse-ptp	A subset of the PTP project providing support for synchronized projects.
rh-eclipse46-eclipse-pydev	A full featured Python IDE for **Eclipse**.
rh-eclipse46-eclipse-remote	The Remote Services plug-in, which provides an extensible remote-services framework.
rh-eclipse46-eclipse-rpm-editor	The **Eclipse** Spec File Editor, which allows you to maintain RPM spec files.
rh-eclipse46-eclipse-rse	The Remote System Explorer (RSE) framework, which allows you to work with remote systems from **Eclipse**.
rh-eclipse46-eclipse-systemtap	The SystemTap plug-in, which integrates **SystemTap** with **Eclipse**.
rh-eclipse46-eclipse-valgrind	The Valgrind plug-in, which integrates **Valgrind** with **Eclipse**.
rh-eclipse46-eclipse-webtools	The **Eclipse** Webtools plug-ins.

4.2.1. Installing Eclipse

The **Eclipse** development environment is provided as a collection of RPM packages. To install the *rh-eclipse46* Software Collection, type the following command as **root**:

```
yum install rh-eclipse46
```

For a list of available components, see Table 4.1, “Eclipse Components Included in the *rh-eclipse46* Software Collection”.

Note

The *rh-eclipse46* Software Collection fully supports C, C++, and Java development, but does *not* provide support for the Fortran programming language.

4.2.2. Using Eclipse

To start the *rh-eclipse46* Software Collection, either select **Applications** → **Programming** → **Red Hat Eclipse** from the panel, or type the following at a shell prompt:

```
scl enable rh-eclipse46 eclipse
```

During its startup, **Eclipse** prompts you to select a *workspace*, that is, a directory in which you want to store your projects. You can either use **~/workspace/**, which is the default option, or click the **Browse** button to browse your file system and select a custom directory. Additionally, you can select the **Use this as the default and do not ask again** check box to prevent **Eclipse** from displaying this dialog box the next time you run this development environment. When you are done, click the **OK** button to confirm the selection and proceed with the startup.

4.2.2.1. Using the Red Hat Developer Toolset Toolchain

To use the *rh-eclipse46* Software Collection with support for the **GNU Compiler Collection** and **binutils** from Red Hat Developer Toolset, make sure that the *devtoolset-6-toolchain* package is installed and run the application as described in Section 4.2.2, “Using Eclipse”. The *rh-eclipse46* Collection uses the Red Hat Developer Toolset toolchain by default.

For detailed instructions on how to install the *devtoolset-6-toolchain* package in your system, see the Red Hat Developer Toolset User Guide.

Important

If you are working on a project that you previously built with the Red Hat Enterprise Linux version of the **GNU Compiler Collection**, make sure that you discard all previous build results. To do so, open the project in **Eclipse** and select **Project → Clean** from the menu.

4.2.2.2. Using the Red Hat Enterprise Linux Toolchain

To use the *rh-eclipse46* Software Collection with support for the toolchain distributed with Red Hat Enterprise Linux, change the configuration of the project to use absolute paths to the Red Hat Enterprise Linux system versions of **gcc**, **g++**, and **as**.

To configure **Eclipse** to explicitly use the Red Hat Enterprise Linux system versions of the tools for the current project, complete the following steps:

1. In the C/C++ perspective, choose **Project → Properties** from the main menu bar to open the project properties.
2. In the menu on the left-hand side of the dialog box, click **C/C++ Build → Settings**.
3. Select the **Tool Settings** tab.
4. If you are working on a C project:
   a. select **GCC C Compiler** or **Cross GCC Compiler** and change the value of the **Command** field to:

      ```
      /usr/bin/gcc
      ```

   b. select **GCC C Linker** or **Cross GCC Linker** and change the value of the **Command** field to:

      ```
      /usr/bin/gcc
      ```

c. select **GCC Assembler** or **Cross GCC Assembler** and change the value of the **Command** field to:

```
/usr/bin/as
```

If you are working on a C++ project:

a. select **GCC C++ Compiler** or **Cross G++ Compiler** and change the value of the **Command** field to:

```
/usr/bin/g++
```

b. select **GCC C Compiler** or **Cross GCC Compiler** and change the value of the **Command** field to:

```
/usr/bin/gcc
```

c. select **GCC C++ Linker** or **Cross G++ Linker** and change the value of the **Command** field to:

```
/usr/bin/g++
```

d. select **GCC Assembler** or **Cross GCC Assembler** and change the value of the **Command** field to:

```
/usr/bin/as
```

5. Click the **OK** button to save the configuration changes.

4.2.3. Additional Resources

A detailed description of **Eclipse** and all its features is beyond the scope of this book. For more information, see the resources listed below.

Installed Documentation

- **Eclipse** includes a built-in **Help** system, which provides extensive documentation for each integrated feature and tool. This greatly decreases the initial time investment required for new developers to become fluent in its use. The use of this Help section is detailed in the *Red Hat Enterprise Linux Developer Guide* linked below.

See Also

- Section 1.3.3, “Changes in Eclipse” provides a comprehensive list of features and improvements over the **Eclipse** development environment included in the previous release of Red Hat Developer Toolset.
- The Red Hat Developer Toolset chapter in the *Red Hat Developer Toolset User Guide* provides an overview of Red Hat Developer Toolset and more information on how to install it on your system.
- The GNU Compiler Collection (GCC) chapter in the *Red Hat Developer Toolset User Guide* provides information on how to compile programs written in C, C++, and Fortran on the command line.

4.3. Thermostat

4.3. Thermostat

The **rh-thermostat16** Software Collection provides a monitoring and instrumentation tool for the OpenJDK HotSpot JVM, with support for monitoring multiple JVM instances. The system is made up of two components: an **Agent**, which collects data, and a **Client**, which allows users to visualize collected data. These components communicate via a storage layer: either directly via **MongoDB** or indirectly via a Web layer for increased security. A pluggable agent and GUI framework allows for collection and visualization of performance data beyond what is included out of the box.

To install the *rh-thermostat16* collection, type the following command as **root**:

```
yum install rh-thermostat16
```

Note that the *rh-thermostat16* Software Collection requires the *rh-java-common* Collection.

To enable the *rh-thermostat16* collection, type the following command at a shell prompt:

```
scl enable rh-thermostat16 bash
```

For more information, refer to the Thermostat User Guide. In order to deploy Thermostat securely, see the Configuration and Administration Guide.

4.4. Ruby on Rails 4.2

Red Hat Software Collections 2.3 adds the *rh-ruby23* Software Collection together with the *rh-ror42* Collection.

To install **Ruby on Rails 4.2**, type the following command as **root**:

```
yum install rh-ror42
```

Installing any package from the *rh-ror42* Software Collection automatically pulls in *rh-ruby23* and *rh-nodejs4* as dependencies.

The *rh-nodejs4* Collection is used by certain gems in an asset pipeline to post-process web resources, for example, **sass** or **coffee-script** source files. To run the **rails s** command without requiring *rh-nodejs4*, disable the **coffee-rails** and **uglifier** gems in the **Gemfile**.

The **Ruby on Rails** Collection can be enabled by the following command, which will automatically enable *rh-ruby23*:

```
scl enable rh-ror42 bash
```

These two Collections are supported together and available only for Red Hat Enterprise Linux 7. On Red Hat Enterprise Linux 6, use the *rh-ruby22* and *rh-ror41* Sotware Collections.

4.5. MongoDB 3.2

To install the *rh-mongodb32* collection, type the following command as **root**:

```
yum install rh-mongodb32
```

Note that the *rh-mongodb32* Software Collection requires the *rh-java-common* Collection.

To run the **MongoDB** shell utility, type the following command:

```
scl enable rh-mongodb32 'mongo'
```

MongoDB 3.2 on Red Hat Enterprise Linux 6

If you are using Red Hat Enterprise Linux 6, the following instructions apply to your system.

To start the **MongoDB** daemon, type the following command as **root**:

```
service rh-mongodb32-mongod start
```

To start the **MongoDB** daemon on boot, type this command as **root**:

```
chkconfig rh-mongodb32-mongod on
```

To start the **MongoDB** sharding server, type this command as **root**:

```
service rh-mongodb32-mongos start
```

To start the **MongoDB** sharding server on boot, type the following command as **root**:

```
chkconfig rh-mongodb32-mongos on
```

Note that the **MongoDB** sharding server does not work unless the user starts at least one configuration server and specifies it in the **mongos.conf** file.

MongoDB 3.2 on Red Hat Enterprise Linux 7

When using Red Hat Enterprise Linux 7, the following commands are applicable.

To start the **MongoDB** daemon, type the following command as **root**:

```
systemctl start rh-mongodb32-mongod.service
```

To start the **MongoDB** daemon on boot, type this command as **root**:

```
systemctl enable rh-mongodb32-mongod.service
```

To start the **MongoDB** sharding server, type the following command as **root**:

```
systemctl start rh-mongodb32-mongos.service
```

To start the **MongoDB** sharding server on boot, type this command as **root**:

```
systemctl enable rh-mongodb32-mongos.service
```

Note that the **MongoDB** sharding server does not work unless the user starts at least one configuration server and specifies it in the **mongos.conf** file.

4.6. Git

Git is a distributed revision control system with a decentralized architecture. As opposed to centralized version control systems with a client-server model, Git ensures that each working copy of a Git repository is an exact copy with complete revision history. This not only allows you to work on and contribute to projects without the need to have permission to push your changes to their official repositories, but also makes it possible for you to work with no network connection. For detailed information, see the Git chapter in the *Red Hat Enterprise Linux 7 Developer Guide*.

4.7. Maven

The *rh-maven33* Software Collection provides a software project management and comprehension tool. Based on the concept of a project object model (POM), **Maven** can manage a project's build, reporting, and documentation from a central piece of information.

To install the *rh-maven33* Collection, type the following command as **root**:

```
yum install rh-maven33
```

To enable this collection, type the following command at a shell prompt:

```
scl enable rh-maven33 bash
```

Global Maven settings, such as remote repositories or mirrors, can be customized by editing the **/opt/rh/rh-maven33/root/etc/maven/settings.xml** file.

For more information about using Maven, refer to the Maven documentation. Usage of plug-ins is described in this section; to find documentation regarding individual plug-ins, see the index of plug-ins.

4.8. Passenger

The *rh-passenger40* Software Collection provides **Phusion Passenger**, a web and application server designed to be fast, robust and lightweight.

The *rh-passenger40* Collection supports multiple versions of **Ruby**, particularly the *ruby193*, *ruby200*, and *rh-ruby22* Software Collections together with **Ruby on Rails** using the *ror40* or *rh-ror41* Collections. Prior to using **Passenger** with any of the **Ruby** Software Collections, install the corresponding package from the *rh-passenger40* Collection: the *rh-passenger-ruby193*, *rh-passenger-ruby200*, or *rh-passenger-ruby22* package.

The *rh-passenger40* Software Collection can also be used with **Apache httpd** from the *httpd24* Software Collection. To do so, install the *rh-passenger40-mod_passenger* package. Refer to the default configuration file **/opt/rh/httpd24/root/etc/httpd/conf.d/passenger.conf** for an example of **Apache httpd** configuration, which shows how to use multiple **Ruby** versions in a single **Apache httpd** instance.

Additionally, the *rh-passenger40* Software Collection can be used with the **nginx 1.6** web server from the *nginx16* Software Collection. To use **nginx 1.6** with *rh-passenger40*, you can run **Passenger** in Standalone mode using the following command in the web appplication's directory:

```
scl enable nginx16 rh-passenger40 'passenger start'
```

Alternatively, edit the *nginx16* configuration files as described in the upstream Passenger documentation.

Chapter 5. Migration

This chapter provides information on migrating to versions of components included in Red Hat Software Collections 2.3.

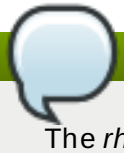
5.1. Migrating to MariaDB 10.1

Red Hat Enterprise Linux 6 contains **MySQL 5.1** as the default **MySQL** implementation. Red Hat Enterprise Linux 7 includes **MariaDB 5.5** as the default **MySQL** implementation. **MariaDB** is a community-developed drop-in replacement for **MySQL**. **MariaDB 10.0** has been available as a Software Collection since Red Hat Software Collections 2.0; Red Hat Software Collections 2.3 is distributed with **MariaDB 10.1**.

The *rh-mariadb101* Software Collection, available for both Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7, does not conflict with the *mysql* or *mariadb* packages from the core systems, so it is possible to install the *rh-mariadb101* Software Collection together with the *mysql* or *mariadb* packages. It is also possible to run both versions at the same time, however, the port number and the socket in the `my.cnf` files need to be changed to prevent these specific resources from conflicting. Additionally, it is possible to install the *rh-mariadb101* Software Collection while the *rh-mariadb100* Collection is still installed and even running.

Note that if you are using an **MariaDB 5.5**, it is necessary to upgrade to the *rh-mariadb100* Software Collection first, which is described in the Red Hat Software Collections 2.0 Release Notes.

For more information about **MariaDB 10.1**, see the upstream documentation about changes in version 10.1 and about upgrading.



Note

The *rh-mariadb101* Software Collection supports neither mounting over NFS nor dynamical registering using the `scl register` command.

5.1.1. Notable Differences Between the *mariadb100* and *rh-mariadb101* Software Collections

- Galera Cluster, a synchronous multi-master cluster, which is a standard part of MariaDB 10.1. See the Knowledgebase article about setting up Galera Cluster with the *rh-mariadb101* Software Collection.
- Since **MariaDB 10.1.7**, the `SQL_MODE` variable is by default set to `NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER` while in earlier versions of **MariaDB** no default was set. Consequently, the `GRANT` statement does not create a user by default. The setting of the `SQL_MODE` variable can be changed in the configuration file. See the upstream documentation for details.

5.1.2. Upgrading from the *rh-mariadb100* to the *rh-mariadb101* Software Collection

Important

Prior to upgrading, back up all your data, including any MariaDB databases.

1. Install the *rh-mariadb101* Software Collection.

```
yum install rh-mariadb101-mariadb-server
```

2. Inspect the configuration of *rh-mariadb101*, which is stored in the **/etc/opt/rh/rh-mariadb101/my.cnf** file and the **/etc/opt/rh/rh-mariadb101/my.cnf.d/** directory. Compare it with the configuration of *rh-mariadb100* stored in **/etc/opt/rh/rh-mariadb100/my.cnf** and **/etc/opt/rh/rh-mariadb100/my.cnf.d/** and adjust it if necessary.

3. Stop the *rh-mariadb100* database server, if it is still running.

```
service rh-mariadb100-mariadb stop
```

4. All the data of the *rh-mariadb100* Software Collection is stored in the **/var/opt/rh/rh-mariadb100/lib/mysql/** directory. Copy the whole content of this directory to **/var/opt/rh/rh-mariadb101/lib/mysql/**. You can also move the content but remember to back up your data before you continue to upgrade.

5. Start the *rh-mariadb101* database server.

```
service rh-mariadb101-mariadb start
```

6. Perform the data migration.

```
scl enable rh-mariadb101 mysql_upgrade
```

If the **root** user has a non-empty password defined (it should have a password defined), it is necessary to call the **mysql_upgrade** utility with the **-p** option and specify the password.

```
scl enable rh-mariadb101 -- mysql_upgrade -p
```

5.2. Migrating to MongoDB 3.2

Red Hat Software Collections 2.3 is shipped with **MongoDB 3.2**, provided by the *rh-mongodb32* Software Collection and available for Red Hat Enterprise Linux 7. Previously released **MongoDB** Software Collections, *mongodb24* and *rh-mongodb26* are available for both Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7. See the Red Hat Software Collections 2.0 Release Notes if you need to upgrade to **MongoDB 2.6**.

Note that when migrating from the *rh-mongodb26* to the *rh-mongodb32* Software Collection, it is necessary to first upgrade to the 3.0-series release of **MongoDB**, which is provided by the *rh-mongodb30upg* Collection.

5.2.1. Notable Differences Between MongoDB 2.6 and MongoDB 3.2

General Changes

The *rh-mongodb32* Software Collection introduces several general changes listed below.

- **MongoDB** now ships configuration files in the YAML format
- **MongoDB** server and tools are no longer shipped in a single package; **MongoDB** tools are packaged in *rh-mongodb32-mongo-tools*
- Improved **MongoDB** testsuite provided by the *rh-mongodb32-mongodb-test* package. For more information about usage, install this package and read the **/opt/rh/rh-mongodb32/root/usr/share/mongodb-test/README** file.

Compatibility Changes

MongoDB 3.2 includes various minor changes that can affect compatibility with previous versions of **MongoDB**.

Compatibility Changes in MongoDB 3.0

- Configuration file options changes due to inclusion of additional storage engines
- Data files must correspond to the configured storage engine; if files in the **dbPath** directory were created by a storage engine other than the current one, an error is returned
- Changes due to using the **WiredTiger** storage engine: **oplog** entries generated by versions of **MongoDB** earlier than 2.2.1 are overwritten
- Replica set configuration validation
- The **w:majority** semantics has been changed so that the **w:majority** value is satisfied when a majority of the voting members replicates a write operation
- The **local.slaves** collection has been removed
- The FATAL replica set state no longer exists
- The **mongodump**, **mongorestore**, **mongoexport**, **mongoimport**, **mongofiles**, and **mongooplog** tools must connect to a running **MongoDB** instance
- The **MongoDB 2.4** user model has been removed
- The localhost exception has been changed so that it allows to create only the first user on the admin database
- The **db.addUser()** function has been removed; use **db.createUser()** and **db.updateUser()** instead
- TLS/SSL changes
- The **mongo** shell versions earlier than 3.0 are not compatible with 3.0 deployments of **MongoDB**
- Index changes
- Direct access to the **system.indexes** and **system.namespaces** collections has been deprecated
- The following commands have been deprecated: **closeAllDatabases**, **getoptime**, **text**, **indexStats**, **db.collection.getIndexStats()**, and **db.collection.indexStats()**
- The **Date** and **Timestamp** data types are no longer equivalent for comparison purposes

For details regarding compatibility changes in **Mongodb 3.0**, refer to the upstream release notes.

Compatibility Changes in MongoDB 3.2

- The **WiredTiger** storage engine is now the default one
- The JavaScript engine has been changed from **V8** to **SpiderMonkey**
- Creation of version 0 indexes is now disallowed
- Aggregation compatibility changes

For detailed compatibility changes in **MongoDB 3.2**, see the upstream release notes.

5.2.2. Upgrading from the *rh-mongodb26* to the *rh-mongodb32* Software Collection

Note that once you have upgraded to **MongoDB 3.2** and started using new features, you cannot downgrade to any earlier version.

Important

Before migrating from the *rh-mongodb26* to the *rh-mongodb32* Software Collection, back up all your data, including any **MongoDB** databases, which are by default stored in the **/var/opt/rh/rh-mongodb26/lib/mongodb/** directory.

To upgrade to the *rh-mongodb32* Software Collection, perform the following steps.

1. Install the **MongoDB** servers and shells from the *rh-mongodb30upg* and *rh-mongodb32* Software Collections:

```
~]# yum install rh-mongodb30upg rh-mongodb30upg-mongodb rh-mongodb32 rh-mongodb32-mongodb
```

2. Connect the **mongo** shell from the *rh-mongodb26* Collection to your **MongoDB 2.6** server (for example, running on **localhost**, port **27017**).

```
~]$ scl enable rh-mongodb26 'mongo --host localhost --port 27017 admin'
```

3. In the **mongo** shell, check your data set for compatibility issues mentioned above and fix the ones that affect your application.

4. Stop the **MongoDB 2.6** server:

```
~]# systemctl stop rh-mongodb26-mongod.service
```

   Use the **service rh-mongodb26-mongodb stop** command if you are using Red Hat Enterprise Linux 6.

5. Copy your data to the new location:

```
~]# cp -a /var/opt/rh/rh-mongodb26/lib/mongodb/* /var/opt/rh/rh-
mongodb32/lib/mongodb
```

6. Change the **dbpath** variable in the **/etc/opt/rh/rh-mongodb30upg/mongod.conf** file to **/var/opt/rh/rh-mongodb32/lib/mongodb/**.

7. Start the **MongoDB** server from the *rh-mongodb30upg* Software Collection:

   ```
   ~]# systemctl start rh-mongodb30upg-mongod.service
   ```

   Use the **service rh-mongodb30upg-mongodb start** command if you are using Red Hat Enterprise Linux 6.

8. Connect the **mongo** shell from the *rh-mongodb32* Collection to your **MongoDB 3.0** server (for example, running on **localhost**, port **27017**).

   ```
   ~]$ scl enable rh-mongodb30upg 'mongo --host localhost --port
   27017 admin'
   ```

9. In the **mongo** shell, check your data set for compatibility issues mentioned above and fix the ones that affect your application.

10. Stop the **MongoDB 3.0** server.

    ```
    ~]# systemctl stop rh-mongodb30upg-mongod.service
    ```

    Use the **service rh-mongodb30upg-mongodb stop** command if you are using Red Hat Enterprise Linux 6.

11. Configure the **rh-mongodb32-mongod** daemon in the **/etc/opt/rh/rh-mongodb32/mongod.conf** file.

12. **MongoDB 3.2** has the new default storage engine, **WiredTiger**, which introduces performance improvements. To be able to run the **MongoDB** server with old data, configure the **rh-mongodb32-mongod** daemon to use the old storage engine. Uncomment the **engine** property in the **storage** section in the **/etc/opt/rh/rh-mongodb32/mongod.conf** file and change its value to **mmapv1**.

13. Start the **MongoDB 3.2** server.

    ```
    ~]# systemctl start rh-mongodb32-mongod.service
    ```

    Use the **service rh-mongodb32-mongodb start** command if you are using Red Hat Enterprise Linux 6.

14. If you want to use the **WiredTiger** storage engine, you have to perform additional migration steps described in the MongoDB documentation.

    ```
    ~]# yum install rh-mongodb32-mongo-tools
    ~]$ scl enable rh-mongodb32 'mongodump --out ~/mongodb.dump'
    ~]# systemctl stop rh-mongodb32-mongod.service
    ~]# rm -rf /var/opt/rh/rh-mongodb32/lib/mongodb/*
    ```

Change the **engine** property in the **/etc/opt/rh/rh-mongodb32/mongod.conf** to **wiredTiger**. Use the **service rh-mongodb32-mongodb stop** command if you are using Red Hat Enterprise Linux 6.

```
~]# systemctl start rh-mongodb32-mongod.service
~]$ scl enable rh-mongodb32 'mongorestore ~/mongodb.dump'
```

Use the **service rh-mongodb32-mongodb start** command if you are using Red Hat Enterprise Linux 6.

For detailed information about upgrading, see the upstream MongoDB 3.0 and MongoDB 3.2 release notes.

For information about upgrading a Replica Set, see the upstream MongoDB Manual.

For information about upgrading a Sharded Cluster, see the upstream MongoDB Manual.

5.3. Migrating to MySQL 5.7

Red Hat Enterprise Linux 6 contains **MySQL 5.1** as the default **MySQL** implementation. Red Hat Enterprise Linux 7 includes **MariaDB 5.5** as the default **MySQL** implementation. In addition to these basic versions, **MySQL 5.6** has been available as a Software Collection for both Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7 since Red Hat Software Collections 2.0.

The *rh-mysql57* Software Collection, available for both Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7, conflicts neither with the *mysql* or *mariadb* packages from the core systems nor with the *rh-mysql56* Software Collection, so it is possible to install the *rh-mysql57* Software Collection together with the *mysql*, *mariadb*, or *rh-mysql56* packages. It is also possible to run multiple versions at the same time; however, the port number and the socket in the **my.cnf** files need to be changed to prevent these specific resources from conflicting.

Note that it is possible to upgrade to **MySQL 5.7** only from **MySQL 5.6**. If you need to upgrade from an earlier version, upgrade to **MySQL 5.6** first. Instructions how to upgrade to **MySQL 5.6** are available in the Red Hat Software Collections 2.2 Release Notes.

5.3.1. Notable Differences Between MySQL 5.6 and MySQL 5.7

- The *mysql-bench* subpackage is not included in the *rh-mysql57* Software Collection.
- Since **MySQL 5.7.7**, the default SQL mode includes **NO_AUTO_CREATE_USER**. Therefore it is necessary to create MySQL accounts using the **CREATE USER** statement because the **GRANT** statement no longer creates a user by default. See the upstream documentation for details.

To find out about more detailed changes in **MySQL 5.7** compared to earlier versions, see the upstream documentation: What Is New in MySQL 5.7 and Changes Affecting Upgrades to MySQL 5.7.

5.3.2. Upgrading to the *rh-mysql57* Software Collection

Important

Prior to upgrading, back-up all your data, including any MySQL databases.

1. Install the *rh-mysql57* Software Collection.

```
yum install rh-mysql57-mysql-server
```

2. Inspect the configuration of *rh-mysql57*, which is stored in the **/etc/opt/rh/rh-mysql57/my.cnf** file and the **/etc/opt/rh/rh-mysql57/my.cnf.d/** directory. Compare it with the configuration of *rh-mysql56* stored in **/etc/opt/rh/rh-mysql56/my.cnf** and **/etc/opt/rh/rh-mysql56/my.cnf.d/** and adjust it if necessary.

3. Stop the *rh-mysql56* database server, if it is still running.

```
service rh-mysql56-mysqld stop
```

4. All data of the *rh-mysql56* Software Collection is stored in the **/var/opt/rh/rh-mysql56/lib/mysql/** directory. Copy the whole content of this directory to **/var/opt/rh/rh-mysql57/lib/mysql/**. You can also move the content but remember to back up your data before you continue to upgrade.

5. Start the *rh-mysql57* database server.

```
service rh-mysql57-mysqld start
```

6. Perform the data migration.

```
scl enable rh-mysql57 mysql_upgrade
```

If the **root** user has a non-empty password defined (it should have a password defined), it is necessary to call the **mysql_upgrade** utility with the **-p** option and specify the password.

```
scl enable rh-mysql57 -- mysql_upgrade -p
```

5.4. Migrating to PostgreSQL 9.5

Red Hat Software Collections 2.3 is distributed with **PostgreSQL 9.5**, which can be safely installed on the same machine in parallel with **PostgreSQL 8.4** from Red Hat Enterprise Linux 6, **PostgreSQL 9.2** from Red Hat Enterprise Linux 7 or Red Hat Software Collections 1, or **PostgreSQL 9.4** from Red Hat Software Collections 2. It is also possible to run more than one version of **PostgreSQL** on a machine at the same time, but you need to use different ports or IP addresses and adjust SELinux policy.

5.4.1. Notable Differences Between PostgreSQL 9.4 and PostgreSQL 9.5

The most notable changes between **PostgreSQL 9.4** and **PostgreSQL 9.5** are desribed in the upstream release notes for versions 9.5, 9.5.1, and 9.5.2.

The following table provides an overview of different paths in a Red Hat Enterprise Linux system version of **PostgreSQL** (*postgresql*) and in the *postgresql92*, *rh-postgresql94*, and *rh-postgresql95* Software Collections. Note that the paths of **PostgreSQL 8.4** distributed with Red Hat Enterprise Linux 6 and the system version of **PostgreSQL 9.2** shipped with Red Hat Enterprise Linux 7 are the same.

Table 5.1. Diferences in the PostgreSQL paths

Content	*postgresql*	*postgresql92*	*rh-postgresql94*	*rh-postgresql95*
Executables	/usr/bin/	/opt/rh/postgresql92/root/usr/bin/	/opt/rh/rh-postgresql94/root/usr/bin/	/opt/rh/rh-postgresql95/root/usr/bin/
Libraries	/usr/lib64/	/opt/rh/postgresql92/root/usr/lib64/	/opt/rh/rh-postgresql94/root/usr/lib64/	/opt/rh/rh-postgresql95/root/usr/lib64/
Documentation	/usr/share/doc/postgresql/html/	/opt/rh/postgresql92/root/usr/share/doc/postgresql/html/	/opt/rh/rh-postgresql94/root/usr/share/doc/postgresql/html/	/opt/rh/rh-postgresql95/root/usr/share/doc/postgresql/html/
PDF documentation	/usr/share/doc/postgresql-docs/	/opt/rh/postgresql92/root/usr/share/doc/postgresql-docs/	/opt/rh/rh-postgresql94/root/usr/share/doc/postgresql-docs/	/opt/rh/rh-postgresql95/root/usr/share/doc/postgresql-docs/
Contrib documentation	/usr/share/doc/postgresql-contrib/	/opt/rh/postgresql92/root/usr/share/doc/postgresql-contrib/	/opt/rh/rh-postgresql94/root/usr/share/doc/postgresql-contrib/	/opt/rh/rh-postgresql95/root/usr/share/doc/postgresql-contrib/
Source	not installed	not installed	not installed	not installed
Data	/var/lib/pgsql/data/	/opt/rh/postgresql92/root/var/lib/pgsql/data/	/var/opt/rh/rh-postgresql94/lib/pgsql/data/	/var/opt/rh/rh-postgresql95/lib/pgsql/data/
Backup area	/var/lib/pgsql/backups/	/opt/rh/postgresql92/root/var/lib/pgsql/backups/	/var/opt/rh/rh-postgresql94/lib/pgsql/backups/	/var/opt/rh/rh-postgresql95/lib/pgsql/backups/
Templates	/usr/share/pgsql/	/opt/rh/postgresql92/root/usr/share/pgsql/	/opt/rh/rh-postgresql94/root/usr/share/pgsql/	/opt/rh/rh-postgresql95/root/usr/share/pgsql/
Procedural Languages	/usr/lib64/pgsql/	/opt/rh/postgresql92/root/usr/lib64/pgsql/	/opt/rh/rh-postgresql94/root/usr/lib64/pgsql/	/opt/rh/rh-postgresql95/root/usr/lib64/pgsql/
Development Headers	/usr/include/pgsql/	/opt/rh/postgresql92/root/usr/include/pgsql/	/opt/rh/rh-postgresql94/root/usr/include/pgsql/	/opt/rh/rh-postgresql95/root/usr/include/pgsql/
Other shared data	/usr/share/pgsql/	/opt/rh/postgresql92/root/usr/share/pgsql/	/opt/rh/rh-postgresql94/root/usr/share/pgsql/	/opt/rh/rh-postgresql95/root/usr/share/pgsql/
Regression tests	/usr/lib64/pgsql/test/regress/ (in the -test package)	/opt/rh/postgresql92/root/usr/lib64/pgsql/test/regress/ (in the -test package)	/opt/rh/rh-postgresql94/root/usr/lib64/pgsql/test/regress/ (in the -test package)	/opt/rh/rh-postgresql95/root/usr/lib64/pgsql/test/regress/ (in the -test package)

For detailed changes, see the upstream PostgreSQL 9.5 Release Notes. For changes between **PostgreSQL 8.4** and **PostgreSQL 9.2**, refer to the Red Hat Software Collections 1.2 Release Notes. Notable changes between **PostgreSQL 9.2** and **PostgreSQL 9.4** are described in Red Hat Software Collections 2.0 Release Notes.

5.4.2. Migrating from a Red Hat Enterprise Linux System Version of PostgreSQL to the PostgreSQL 9.5 Software Collection

Red Hat Enterprise Linux 6 includes **PostgreSQL 8.4**, Red Hat Enterprise Linux 7 is distributed with **PostgreSQL 9.2**. To migrate your data from a Red Hat Enterprise Linux system version of

PostgreSQL to the *rh-postgresql95* Software Collection, you can either perform a fast upgrade using the **pg_upgrade** tool (recommended), or dump the database data into a text file with SQL commands and import it in the new database. Note that the second method is usually significantly slower and may require manual fixes; see the PostgreSQL documentation for more information about this upgrade method. The following procedures are applicable for both Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7 system versions of **PostgreSQL**.

Important

Before migrating your data from a Red Hat Enterprise Linux system version of PostgreSQL to PostgreSQL 9.5, make sure that you back up all your data, including the PostgreSQL database files, which are *by default* located in the **/var/lib/pgsql/data/** directory.

Procedure 5.1. Fast Upgrade Using the pg_upgrade Tool

To perform a fast upgrade of your PostgreSQL server, complete the following steps:

1. Stop the old PostgreSQL server to ensure that the data is not in an inconsistent state. To do so, type the following at a shell prompt as **root**:

   ```
   service postgresql stop
   ```

   To verify that the server is not running, type:

   ```
   service postgresql status
   ```

2. Verify that the old directory **/var/lib/pgsql/data/** exists:

   ```
   file /var/lib/pgsql/data/
   ```

   and back up your data.

3. Verify that the new data directory **/var/opt/rh/rh-postgresql95/lib/pgsql/data/** does not exist:

   ```
   file /var/opt/rh/rh-postgresql95/lib/pgsql/data/
   ```

   If you are running a fresh installation of **PostgreSQL 9.5**, this directory should not be present in your system. If it is, back it up by running the following command as **root**:

   ```
   mv /var/opt/rh/rh-postgresql95/lib/pgsql/data{,-scl-backup}
   ```

4. Upgrade the database data for the new server by running the following command as **root**:

   ```
   scl enable rh-postgresql95 -- postgresql-setup --upgrade
   ```

   Alternatively, you can use the **/opt/rh/rh-postgresql95/root/usr/bin/postgresql-setup --upgrade** command.

   Note that you can use the **--upgrade-from** option for upgrade from different versions of **PostgreSQL**. The list of possible upgrade scenarios is available using the **--upgrade-ids** option.

It is recommended that you read the resulting **/var/lib/pgsql/upgrade_rh-postgresql95-postgresql.log** log file to find out if any problems occurred during the upgrade.

5. Start the new server as **root**:

```
service rh-postgresql95-postgresql start
```

It is also advised that you run the **analyze_new_cluster.sh** script as follows:

```
su - postgres -c 'scl enable rh-postgresql95
~/analyze_new_cluster.sh'
```

6. Optionally, you can configure the PostgreSQL 9.5 server to start automatically at boot time. To disable the old system PostgreSQL server, type the following command as **root**:

```
chkconfig postgresql off
```

To enable the PostgreSQL 9.5 server, type as **root**:

```
chkconfig rh-postgresql95-postgresql on
```

7. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql95/lib/pgsql/data/pg_hba.conf** configuration file. Otherwise only the **postgres** user will be allowed to access the database.

Procedure 5.2. Performing a Dump and Restore Upgrade

To perform a dump and restore upgrade of your PostgreSQL server, complete the following steps:

1. Ensure that the old PostgreSQL server is running by typing the following at a shell prompt as **root**:

```
service postgresql start
```

2. Dump all data in the PostgreSQL database into a script file. As **root**, type:

```
su - postgres -c 'pg_dumpall > ~/pgdump_file.sql'
```

3. Stop the old server by running the following command as **root**:

```
service postgresql stop
```

4. Initialize the data directory for the new server as **root**:

```
scl enable rh-postgresql95-postgresql -- postgresql-setup --
initdb
```

5. Start the new server as **root**:

```
service rh-postgresql95-postgresql start
```

6. Import data from the previously created SQL file:

```
su - postgres -c 'scl enable rh-postgresql95 "psql -f
~/pgdump_file.sql postgres"'
```

7. Optionally, you can configure the PostgreSQL 9.5 server to start automatically at boot time. To disable the old system PostgreSQL server, type the following command as **root**:

   ```
   chkconfig postgresql off
   ```

   To enable the PostgreSQL 9.5 server, type as **root**:

   ```
   chkconfig rh-postgresql95-postgresql on
   ```

8. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql95/lib/pgsql/data/pg_hba.conf** configuration file. Otherwise only the **postgres** user will be allowed to access the database.

5.4.3. Migrating from the PostgreSQL 9.4 Software Collection to the PostgreSQL 9.5 Software Collection

To migrate your data from the *rh-postgresql94* Software Collection to the *rh-postgresql95* Collection included in Red Hat Software Collections 2.3, you can either perform a fast upgrade using the **pg_upgrade** tool (recommended), or dump the database data into a text file with SQL commands and import it in the new database. Note that the second method is usually significantly slower and may require manual fixes; see the PostgreSQL documentation for more information about this upgrade method.

Important

Before migrating your data from **PostgreSQL 9.4** to **PostgreSQL 9.5**, make sure that you back up all your data, including the PostgreSQL database files, which are by default located in the **/var/opt/rh/rh-postgresql94/lib/pgsql/data/** directory.

Procedure 5.3. Fast Upgrade Using the pg_upgrade Tool

To perform a fast upgrade of your PostgreSQL server, complete the following steps:

1. Stop the old PostgreSQL server to ensure that the data is not in an inconsistent state. To do so, type the following at a shell prompt as **root**:

   ```
   service rh-postgresql94-postgresql stop
   ```

   To verify that the server is not running, type:

   ```
   service rh-postgresql94-postgresql status
   ```

2. Verify that the old directory **/var/opt/rh/rh-postgresql94/lib/pgsql/data/** exists:

   ```
   file /var/opt/rh/rh-postgresql94/lib/pgsql/data/
   ```

   and back up your data.

3. Verify that the new data directory **/var/opt/rh/rh-postgresql95/lib/pgsql/data/** does not exist:

```
file /var/opt/rh/rh-postgresql95/lib/pgsql/data/
```

If you are running a fresh installation of **PostgreSQL 9.5**, this directory should not be present in your system. If it is, back it up by running the following command as **root**:

```
mv /var/opt/rh/rh-postgresql95/lib/pgsql/data{,-scl-backup}
```

4. Upgrade the database data for the new server by running the following command as **root**:

```
scl enable rh-postgresql95 -- postgresql-setup --upgrade --
upgrade-from=rh-postgresql94-postgresql
```

Alternatively, you can use the **/opt/rh/rh-postgresql95/root/usr/bin/postgresql-setup --upgrade --upgrade-from=rh-postgresql94-postgresql** command.

Note that you can use the **--upgrade-from** option for upgrading from different versions of **PostgreSQL**. The list of possible upgrade scenarios is available using the **--upgrade-ids** option.

It is recommended that you read the resulting **/var/lib/pgsql/upgrade_rh-postgresql95-postgresql.log** log file to find out if any problems occurred during the upgrade.

5. Start the new server as **root**:

```
service rh-postgresql95-postgresql start
```

It is also advised that you run the **analyze_new_cluster.sh** script as follows:

```
su - postgres -c 'scl enable rh-postgresql95
~/analyze_new_cluster.sh'
```

6. Optionally, you can configure the PostgreSQL 9.5 server to start automatically at boot time. To disable the old PostgreSQL 9.4 server, type the following command as **root**:

```
chkconfig rh-postgresql94-postgreqsql off
```

To enable the PostgreSQL 9.5 server, type as **root**:

```
chkconfig rh-postgresql95-postgresql on
```

7. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql95/lib/pgsql/data/pg_hba.conf** configuration file. Otherwise only the **postgres** user will be allowed to access the database.

Procedure 5.4. Performing a Dump and Restore Upgrade

To perform a dump and restore upgrade of your PostgreSQL server, complete the following steps:

1. Ensure that the old PostgreSQL server is running by typing the following at a shell prompt as **root**:

```
service rh-postgresql94-postgresql start
```

2. Dump all data in the PostgreSQL database into a script file. As **root**, type:

```
su - postgres -c 'scl enable rh-postgresql94 "pg_dumpall" >
~/pgdump_file.sql'
```

3. Stop the old server by running the following command as **root**:

```
service rh-postgresql94-postgresql stop
```

4. Initialize the data directory for the new server as **root**:

```
scl enable rh-postgresql95-postgresql -- postgresql-setup --
initdb
```

5. Start the new server as **root**:

```
service rh-postgresql95-postgresql start
```

6. Import data from the previously created SQL file:

```
su - postgres -c 'scl enable rh-postgresql95 "psql -f
~/pgdump_file.sql postgres"'
```

7. Optionally, you can configure the PostgreSQL 9.5 server to start automatically at boot time. To disable the old PostgreSQL 9.4 server, type the following command as **root**:

```
chkconfig rh-postgresql94-postgresql off
```

   To enable the PostgreSQL 9.5 server, type as **root**:

```
chkconfig rh-postgresql95-postgresql on
```

8. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql95/lib/pgsql/data/pg_hba.conf** configuration file. Otherwise only the **postgres** user will be allowed to access the database.

If you need to migrate from the *postgresql92* Software Collection, refer to Red Hat Software Collections 2.0 Release Notes; the procedure is the same, you just need to adjust the version of the new Collection.

5.5. Migrating to nginx 1.8

The root directory for the *rh-nginx18* Software Collection is located in **/opt/rh/rh-nginx18/root/**. The error log is stored in **/var/opt/rh/rh-nginx18/log/nginx** by default, and the init script is called **rh-nginx18-nginx**.

Configuration files are now stored in the **/etc/opt/rh/rh-nginx18/nginx/** directory. Configuration files in **nginx 1.8** have the same format as in the previous versions and they are compatible among versions 1.4, 1.6, and 1.8.

Important

Before upgrading from **nginx 1.6** to **nginx 1.8**, back up all your data, including web pages and configuration files located in the **/opt/rh/nginx16/root/** tree.

If you have made any specific changes, such as changing configuration files or setting up web applications, in the **/opt/rh/nginx16/root/** tree, replicate those changes in the new **/opt/rh/rh-nginx18/root/** and **/etc/opt/rh/rh-nginx18/nginx/** directories, too.

You can use this procedure to upgrade directly from **nginx 1.4** to **nginx 1.8**. Use the appropriate paths for **nginx 1.4** in this case.

For the official **nginx** documentation, refer to http://nginx.org/en/docs/.

Chapter 6. Additional Resources

This chapter provides references to other relevant sources of information about Red Hat Software Collections 2.3 and Red Hat Enterprise Linux.

6.1. Red Hat Enterprise Linux Developer Program Group

Users of Red Hat Software Collections can access the Red Hat Enterprise Linux Developer Program Group in the Red Hat Customer Portal to get developer related information for the development tools available for Red Hat Enterprise Linux. In addition, users can find developer related papers and videos on topics that are of interest to developers, for example RPM building, threaded programming, performance tuning, debugging, and so on.

To visit the Red Hat Enterprise Linux Developer Program Group, log in to the Red Hat Customer Portal, click **Products & Services** at the top of the page, choose **Services**, and then **Red Hat Enterprise Linux Developer Program** from the list.

6.2. Red Hat Product Documentation

The following documents are directly or indirectly relevant to this book:

- Red Hat Software Collections 2.3 Packaging Guide — The *Packaging Guide* for Red Hat Software Collections explains the concept of Software Collections, documents the **scl** utility, and provides a detailed explanation of how to create a custom Software Collection or extend an existing one.
- Red Hat Developer Toolset 6.0 Release Notes — The *Release Notes* for Red Hat Developer Toolset document known problems, possible issues, changes, and other important information about this Software Collection.
- Red Hat Developer Toolset 6.0 User Guide — The *User Guide* for Red Hat Developer Toolset contains more information about installing and using this Software Collection.
- Using Red Hat Software Collections Container Images — This article provides information on how to use container images based on Red Hat Software Collections. The available container images include applications, daemons, and databases. The images can be run on Red Hat Enterprise Linux 7 Server and Red Hat Enterprise Linux Atomic Host.
- Get Started with Docker Formatted Container Images — This guide contains a comprehensive overview of information about building and using docker-formatted container images on Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux Atomic Host.
- Using and Configuring Red Hat Subscription Manager — The *Using and Configuring Red Hat Subscription Manager* book provides detailed information on how to register Red Hat Enterprise Linux systems, manage subscriptions, and view notifications for the registered systems.
- Red Hat Enterprise Linux 6 Deployment Guide — The *Deployment Guide* for Red Hat Enterprise Linux 6 provides relevant information regarding the deployment, configuration, and administration of this system.
- Red Hat Enterprise Linux 7 System Administrator's Guide — The *System Administrator's Guide* for Red Hat Enterprise Linux 7 provides information on deployment, configuration, and administration of this system.

6.3. Red Hat Developer Blog

Red Hat Developer Blog content is directed to designers and developers of applications based on Red Hat technologies. It contains links to product team blogs and other relevant internal and external resources. Its goal is to inform and engage the developer community with up-to-date information, best practices, opinion, product and program announcements as well as pointers to sample code and other resources.

Appendix A. Revision History

Revision 2.3-10 **Tue Nov 15 2016** **Lenka Špačková**

Release of Red Hat Software Collections 2.3 Release Notes.

Revision 2.3-7 **Tue Nov 01 2016** **Lenka Špačková**

Minor improvements.

Revision 2.3-5 **Thu Oct 26 2016** **Lenka Špačková**

Added a link to an updated Thermostat User Guide for Red Hat Software Collections 2.3.

Revision 2.3-4 **Fri Oct 21 2016** **Lenka Špačková**

Added a known issue related to the *rh-ruby23* Software Collection.

Revision 2.3-2 **Thu Oct 20 2016** **Lenka Špačková**

Release of Red Hat Software Collections 2.3 Beta Release Notes.