Red Hat Software Collections 3

3.0 Release Notes

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Abstract

The Red Hat Software Collections 3.0 Release Notes document the major features and contain important information about known problems in Red Hat Software Collections 3.0. 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 3.0

This chapter serves as an overview of the Red Hat Software Collections 3.0 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 3.0 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 3.0 provides recent stable versions of the tools listed in Table 1.1, "Red Hat Software Collections 3.0 Components".

Table 1.1. Red Hat Software Collections 3.0 Components

Component	Software Collection	Description

Component	Software Collection	Description
Red Hat Developer Toolset 7.0	devtoolset-7	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 4.6.3[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 7.0 with PEAR 1.10, enhanced language features and *performance improvement*.
PHP 7.1.8 [a]	rh-php71	A release of PHP 7.1 with PEAR 1.10, *APCu 5.1.8*, and enhanced language features.

Component	Software Collection	Description
Python 2.7.13	python27	A release of Python 2.7 with a number of additional utilities. This Python version provides various features and enhancements, including an ordered dictionary type, faster I/O operations, and improved forward compatibility with Python 3. The python27 Software Collections contains the *Python 2.7.13 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**.
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**.
Python 3.6.3	rh-python36	The rh-python36 Software Collection contains Python 3.6.3, which introduces a number of new features, such as *f-strings, syntax for variable annotations, and asynchronous generators and comprehensions*. In addition, a set of extension libraries useful for programming web applications is included, with **mod_wsgi** (supported only together 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.

Component	Software Collection	Description
Ruby 2.4.0	rh-ruby24	A release of Ruby 2.4. This version provides multiple performance improvements and enhancements, for example *improved hash table, new debugging features, support for Unicode case mappings, and support for OpenSSL 1.1.0*. Ruby 2.4.0 maintains source-level backward compatibility with Ruby 2.3.1, 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, a 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.
Ruby on Rails 5.0.1	rh-ror50	A release of Ruby on Rails 5.0, the latest version of the web application framework written in the Ruby language. Notable new features include *Action Cable, API mode, exclusive use of rails CLI over Rake, and ActionRecord attributes*. This Software Collection is supported together with the rh-ruby24 and rh-nodejs6 Collections.
Scala 2.10.6 [a]	rh-scala210	A release of Scala, a general purpose programming language for the Java platform, which integrates features of object-oriented and functional languages.
MariaDB 10.0.28	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.
MariaDB 10.1.19	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*.

Component	Software Collection	Description
MariaDB 10.2.8	rh-mariadb102	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 *MariaDB Backup, Flashback, support for Recursive Common Table Expressions, window functions, and JSON functions*.
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 3.4.9	rh-mongodb34	A release of MongoDB, a cross-platform document-oriented database system classified as a NoSQL database. This release introduces support for new architectures, *adds message compression and support for the decimal128 type, enhances collation features* and more.
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 5.6.37	rh-mysql56	A release of MySQL, which provides a number of new features and enhancements, including improved performance.
MySQL 5.7.19	rh-mysql57	A release of MySQL, which provides a number of new features and enhancements, including improved performance.
PostgreSQL 9.4.14	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.

Component	Software Collection	Description
PostgreSQL 9.5.9	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.
PostgreSQL 9.6.5	rh-postgresql96	A release of PostgreSQL, which introduces parallel execution of sequential scans, joins, and aggregates, and provides enhancements to synchronous replication, full-text search, deration driver, postgres_fdw, as well as performance improvements.
Node.js 4.6.2	rh-nodejs4	A release of Node.js, which provides a JavaScript runtime built on Chrome's V8 JavaScript engine and **npm 2.15.1**, a package manager for JavaScript. This version includes an enhanced API, multiple security and bug fixes, and *support for the SPDY protocol version 3.1*
Node.js 6.11.3	rh-nodejs6	A release of Node.js, which provides multiple API enhancements, performance and security improvements, *ECMAScript 2015 support*, and **npm 3.10.9**.
Node.js 8.6.0 [a]	rh-nodejs8	A release of Node.js, which provides multiple API enhancements and new features, including *V8 engine version 6.0, npm 5.3.0 and npx, enhanced security, experimental N-API support, and performance improvements.*
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.*
nginx 1.10.2	rh-nginx110	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 *dynamic module support, HTTP/2 support, Perl integration, and numerous performance improvements.*
nginx 1.12.1 [a]	rh-nginx112	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 *IP Transparency, improved TCP/UDP load balancing, enhanced caching performance, and numerous performance improvements*.

Component	Software Collection	Description
Apache httpd 2.4.27	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.
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.*
Maven 3.5.0 [a]	rh-maven35	A release of Maven, a software project management and comprehension tool. This release introduces support for new architectures and a number of new features, including *colorized logging.*
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, and rh-ror41 Software Collections.

Component	Software Collection	Description
[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	Architectures supported on RHEL7
Components New in Red Hat Software Collections 3.0			
Red Hat Developer Toolset 7.0	devtoolset-7	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64, ppc64le
PHP 7.1.8	rh-php71	RHEL7	x86_64, s390x, aarch64, ppc64le
nginx 1.12.1	rh-nginx112	RHEL7	x86_64, s390x, aarch64, ppc64le
Python 3.6.3	rh-python36	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64le
Maven 3.5.0	rh-maven35	RHEL7	x86_64, s390x, aarch64, ppc64le
MariaDB 10.2.8	rh-mariadb102	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64le
PostgreSQL 9.6.5	rh-postgresql96	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64le
MongoDB 3.4.9	rh-mongodb34	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64le
Node.js 8.6.0	rh-nodejs8	RHEL7	x86_64, s390x, aarch64, ppc64le

Components Updated in Red Hat Software Collections 3.0			
Apache httpd 2.4.27	httpd24	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64le

Components Last Updated in Red Hat Software Collections 2.4			
Red Hat Developer Toolset 6.1	devtoolset-6	RHEL6, RHEL7	x86_64, s390x, aarch64, ppc64, ppc64le
Scala 2.10.6	rh-scala210	RHEL7	x86_64
nginx 1.10.2	rh-nginx110	RHEL6, RHEL7	x86_64
Node.js 6.11.3	rh-nodejs6	RHEL6, RHEL7	x86_64
Ruby 2.4.0	rh-ruby24	RHEL6, RHEL7	x86_64
Ruby on Rails 5.0.1	rh-ror50	RHEL6, RHEL7	x86_64
Eclipse 4.6.3	rh-eclipse46	RHEL7	x86_64
Python 2.7.13	python27	RHEL6, RHEL7	x86_64
Thermostat 1.6.6	rh-thermostat16*	RHEL6, RHEL7	x86_64
Maven 3.3.9	rh-maven33	RHEL6, RHEL7	x86_64
Common Java Packages 1.1	rh-java-common	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.3			
Git 2.9.3	rh-git29	RHEL6, RHEL7	x86_64
Redis 3.2.4	rh-redis32	RHEL6, RHEL7	x86_64
Perl 5.24.0	rh-perl524	RHEL6, RHEL7	x86_64
PHP 7.0.10	rh-php70	RHEL6, RHEL7	x86_64
MySQL 5.7.19	rh-mysql57	RHEL6, RHEL7	x86_64
Python 3.5.1	rh-python35	RHEL6, RHEL7	x86_64
MongoDB 3.2.10	rh-mongodb32	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.3			
Ruby 2.3.1	rh-ruby23	RHEL6, RHEL7	x86_64
PHP 5.6.25	rh-php56	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.2			
Red Hat Developer Toolset 4.1	devtoolset-4	RHEL6, RHEL7	x86_64
MariaDB 10.1.19	rh-mariadb101	RHEL6, RHEL7	x86_64
MongoDB 3.0.11 upgrade collection	rh-mongodb30upg	RHEL6, RHEL7	x86_64
Node.js 4.6.2	rh-nodejs4	RHEL6, RHEL7	x86_64
PostgreSQL 9.5.9	rh-postgresql95	RHEL6, RHEL7	x86_64
Ruby on Rails 4.2.6	rh-ror42	RHEL6, RHEL7	x86_64
MongoDB 2.6.9	rh-mongodb26	RHEL6, RHEL7	x86_64
Thermostat 1.4.4	thermostat1*	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.1			
Varnish Cache 4.0.3	rh-varnish4	RHEL6, RHEL7	x86_64
nginx 1.8.1	rh-nginx18	RHEL6, RHEL7	x86_64
Node.js 0.10	nodejs010*	RHEL6, RHEL7	x86_64
Maven 3.0.5	maven30*	RHEL6, RHEL7	x86_64
V8 3.14.5.10	v8314	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.0			
Red Hat Developer Toolset 3.1	devtoolset-3*	RHEL6, RHEL7	x86_64
Perl 5.20.1	rh-perl520	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 2.0			
Python 3.4.2	rh-python34	RHEL6, RHEL7	x86_64
Ruby 2.2.2	rh-ruby22	RHEL6, RHEL7	x86_64
Ruby on Rails 4.1.5	rh-ror41	RHEL6, RHEL7	x86_64
MariaDB 10.0.28	rh-mariadb100	RHEL6, RHEL7	x86_64
MySQL 5.6.37	rh-mysql56	RHEL6, RHEL7	x86_64
PostgreSQL 9.4.14	rh-postgresql94	RHEL6, RHEL7	x86_64
Passenger 4.0.50	rh-passenger40	RHEL6, RHEL7	x86_64
PHP 5.4.40	php54*	RHEL6, RHEL7	x86_64
PHP 5.5.21	php55*	RHEL6, RHEL7	x86_64
nginx 1.6.2	nginx16*	RHEL6, RHEL7	x86_64
DevAssistant 0.9.3	devassist09*	RHEL6, RHEL7	x86_64

Components Last Updated in Red Hat Software Collections 1			
Git 1.9.4	git19*	RHEL6, RHEL7	x86_64
Perl 5.16.3	perl516*	RHEL6, RHEL7	x86_64
Python 3.3.2	python33*	RHEL6, RHEL7	x86_64
Ruby 1.9.3	ruby193*	RHEL6, RHEL7	x86_64
Ruby 2.0.0	ruby200*	RHEL6, RHEL7	x86_64
Ruby on Rails 4.0.2	ror40*	RHEL6, RHEL7	x86_64
MariaDB 5.5.53	mariadb55*	RHEL6, RHEL7	x86_64
MongoDB 2.4.9	mongodb24*	RHEL6, RHEL7	x86_64
MySQL 5.5.52	mysql55*	RHEL6, RHEL7	x86_64
PostgreSQL 9.2.18	postgresql92*	RHEL6, RHEL7	x86_64

RHEL6 — Red Hat Enterprise Linux 6

RHEL7 — Red Hat Enterprise Linux 7

x86_64 — AMD64 and Intel 64 architectures

s390x — IBM z Systems

aarch64 — The 64-bit ARM architecture

ppc64 — IBM POWER, big endian

ppc64le — IBM POWER, little endian

* Retired component — this Software Collection is no longer supported

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 3.0

1.3.1. Overview

Architectures
The Red Hat Software Collections offering contains packages for Red Hat Enterprise Linux 7 running on AMD64 and Intel 64 architectures; certain Software Collections are available also for Red Hat Enterprise Linux 6.

In addition, Red Hat Software Collections 3.0 introduces support for the following architectures on Red Hat Enterprise Linux 7:

- The 64-bit ARM architecture

- IBM z Systems

- IBM POWER, little endian

New Software Collections
Red Hat Software Collections 3.0 adds these new Software Collections:

- devtoolset-7 — see Section 1.3.3, "Changes in Red Hat Developer Toolset"

- rh-mariadb102 — see Section 1.3.4, "Changes in MariaDB"

- rh-maven35 — see Section 1.3.5, "Changes in Maven"

- rh-mongodb34 — see Section 1.3.6, "Changes in MongoDB"

- rh-nginx112 — see Section 1.3.7, "Changes in nginx"

- rh-nodejs8 — see Section 1.3.8, "Changes in Node.js"

- rh-php71 — see Section 1.3.9, "Changes in PHP"

- rh-postgresql96 — see Section 1.3.10, "Changes in PostgreSQL"

- rh-python36 — see Section 1.3.11, "Changes in Python"

Updated Software Collections
The following component has been updated in Red Hat Software Collections 3.0:

- httpd24 — see Section 1.3.12, "Changes in Apache httpd"

Red Hat Software Collections Container Images
The following container images are new in Red Hat Software Collections 3.0:

- rhscl/devtoolset-7-toolchain-rhel7

- rhscl/devtoolset-7-perftools-rhel7

- rhscl/mariadb-102-rhel7

- rhscl/mongodb-34-rhel7

- rhscl/nginx-112-rhel7

- rhscl/nodejs-8-rhel7

- rhscl/php-71-rhel7

- rhscl/postgresql-96-rhel7

- rhscl/python-36-rhel7

The following container image has been updated in Red Hat Software Collections 3.0:

- rhscl/httpd-24-rhel7

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

1.3.2. General Changes

The `/usr/bin/scl enable` command can now be used in the `#!` (shebang) line of a script. This enables interpreted scripts to use **Python**, **PHP**, **Perl** or **Node.js** interpreters from Software Collections. Previously, interpreted scripts could be executed only indirectly or from within the `scl` environment.

1.3.3. Changes in Red Hat Developer Toolset

The following components have been upgraded in Red Hat Developer Toolset 7.0 compared to the previous release of Red Hat Developer Toolset:

- **GCC** to version 7.2.1

- **binutils** to version 2.28

- **elfutils** to version 0.170

- **make** to version 4.2.1

- **GDB** to version 8.0.1

- **strace** to version 4.17

- **SystemTap** to version 3.1

- **Valgrind** to version 3.13.0

- **OProfile** to version 1.2.0

- **Dyninst** to version 9.3.2

For detailed information on changes in 7.0, see the Red Hat Developer Toolset User Guide .

1.3.4. Changes in MariaDB

The new rh-mariadb102 Software Collection provides **MariaDB 10.2.8**. The most notable changes in this version include:

- MariaDB Backup

- Flashback

- Support for Recursive Common Table Expressions

- Window functions

- A complete set of JSON functions

- The mysqlbinlog utility now supports continuous binary log backups

Refer to the upstream documentation for further changes and improvements.

In addition, this Software Collection includes the rh-mariadb102-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-mariadb102*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-mariadb102* packages. Note that the *-syspaths packages conflict with the corresponding packages from the base Red Hat Enterprise Linux system.

For migration instructions, refer to Section 5.1, "Migrating to MariaDB 10.2".

1.3.5. Changes in Maven

The new rh-maven35 Software Collection includes **Maven 3.5.0**, which provides a number of bug fixes and enhancements over the previous version. Notably, color logging on console is now supported for improved output visibility. The rh-maven35 Software Collection is available only for Red Hat Enterprise Linux 7.

For detailed changes in **Maven 3.5.0**, see the upstream release notes.

1.3.6. Changes in MongoDB

The new rh-mongodb34 Software Collection includes **MongoDB 3.4.9**, which provides a number of bug fixes and enhancements over the previous version. The most notable changes are:

- MongoDB Zones for maintaining geographic data locality, implementing tiered storage, or ensuring continuous service availability across data centers

- Elastic scalability, which provides faster auto-balancing of data across nodes, faster replica set synchronization, and intra-cluster network compression

- Tunable consistency controls, improving the way queries are routed across a distributed cluster with secondary consistency control and providing ability to configure linearizable reads

The following subpackages have also been updated:

- mongo-cxx-driver to version 3.1.2

- mongo-tools to version 3.4.7

- mongo-java-driver to version 3.5.0

For detailed changes in **MongoDB 3.4**, refer to the upstream release notes.

Note that the rh-mongodb34-mongo-java-driver package is available only for Red Hat Enterprise Linux 7. On Red Hat Enterprise Linux 6, use the updated mongo-java-driver package from the rh-mongodb32 Software Collection instead, which has been updated through an asynchronous release.

The rh-mongodb34 Software Collection does not require the rh-java-common Collection for runtime.

In addition, this Software Collection includes the rh-mongodb34-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-mongodb34*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-mongodb34* packages.

> **NOTE**
>
> The rh-mongodb34-mongo-cxx-driver package has been built with the `-std=gnu++14` option using **GCC** from Red Hat Developer Toolset 6. Binaries using the shared library for the MongoDB C++ Driver that use C++11 (or later) features have to be built also with Red Hat Developer Toolset 6. See C++ compatibility details in the Red Hat Developer Toolset 6 User Guide.

For instructions regarding migration, see Section 5.2, "Migrating to MongoDB 3.4".

1.3.7. Changes in nginx

The new rh-nginx112 Software Collection provides **nginx 1.12.1**, which introduces a number of new features, including:

- IP Transparency

- Support for variables

- Improvements to HTTP/2

- Improved TCP/UDP load balancing

- Enhanced caching performance

- Support for multiple SSL certificates of different types

- Enhancements to the stream module

- Improved support for dynamic modules

- Numerous performance improvements

For more information regarding changes in **nginx 1.12**, see the upstream release notes.

The rh-nginx112 Software Collection is available only for Red Hat Enterprise Linux 7.4 and later versions.

Note that the rh-nginx112 Software Collection does not support integration with **Phusion Passenger**. Users requiring **nginx** with **Passenger** support should continue using the rh-nginx18 Software Collection, which provides **nginx** version 1.8.

The rh-nginx112 Software Collection has optional support for Perl in conjunction with the rh-perl524 Software Collection. To be able to configure Perl handlers and call Perl functions from SSI scripts, install the rh-nginx112-nginx-mod-http-perl package. For more information, see the upstream documentation.

For migration instructions, see Section 5.5, "Migrating to nginx 1.12".

1.3.8. Changes in Node.js

The new rh-nodejs8 Software Collection includes **Node.js 8.6.0**, **npm 5.3.0**, and **npx**. This version provides numerous new features, security and bug fixes. Notable features are as follows:

- A new **async_hooks** module

- **V8** engine version 6.0

- Experimental support for N-API

- Support for HTTP/2

- Performance improvements

Node.js 8.6.0 also deprecates several modules and command-line arguments. For detailed changes, see the upstream release notes and upstream documentation.

The rh-nodejs8 Software Collection is available only for Red Hat Enterprise Linux 7.4 and later versions.

The rh-nodejs6 Software Collection has been upgraded to version 6.11.3 with security and bug fixes through an asynchronous update. For more information about **Node.js 6.11.3**, see the upstream release notes.

1.3.9. Changes in PHP

The new rh-php71 Software Collection includes **PHP 7.1.8**, **PEAR 1.10.4**, and the **APCu** extension version 5.1.8. The rh-php71 Software Collection is available only for Red Hat Enterprise Linux 7.

For detailed information on bug fixes and enhancements provided by rh-php71, see the upstream change log. For information regarding migrating from **PHP 7.0** to **PHP 7.1**, see the upstream migration guide.

1.3.10. Changes in PostgreSQL

The new rh-postgresql96 Software Collection provides **PostgreSQL 9.6.5**. The notable changes in this release include:

- Parallel execution of sequential scans, joins, and aggregates

- Enhancements to synchronous replication

- Improved full-text search enabling users to search for phrases

- The `postgres_fdw` data federation driver now supports remote joins, sorts, UPDATEs, and DELETEs

- Substantial performance improvements, especially regarding scalability on multi-CPU-socket servers

For detailed changes, see the upstream documetation.

In addition, this Software Collection includes the rh-postgresql96-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-postgreqsl96*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-postgreqsl96* packages. Note that the *-syspaths packages conflict with the corresponding packages from the base Red Hat Enterprise Linux system.

For information on migration, see Section 5.4, "Migrating to PostgreSQL 9.6".

1.3.11. Changes in Python

The new rh-python36 Software Collection contains **Python 3.6.3**, which introduces a number of new features, for example:

- Formatted string literals (f-strings)

- Syntax for variable annotations

- Asynchronous generators

- Asynchronous comprehensions

- New secrets module

- A new implementation of the dict mapping type – dictionaries are now faster and use 20% to 25% less memory

For further enhancements and changes, refer to the upstream documentation.

The rh-python36 Software Collection also provides a suite of **Python** libraries and tools. The most notable ones are available in the following versions:

- **pip 9.0.1**

- **scipy 0.19.1**

- **numpy 1.13.1**

- **mod_wsgi 4.5.18** (supported only together with the httpd24 Software Collection)

- **PyMySQL 0.7.11**

1.3.12. Changes in Apache httpd

The httpd24 Software Collection has been upgraded to upstream version 2.4.27, which provides a number of bug fixes and enhancements over the previous version, including multiple improvements to HTTP/2 support.

Note that in **httpd 2.4.27**, the **mod_http2** module is no longer supported with the default `prefork` Multi-Processing Module (MPM). To enable HTTP/2 support, edit the configuration file at `/opt/rh/httpd24/root/etc/httpd/conf.modules.d/00-mpm.conf` and switch to the **event** or **worker** MPM.

For more information on changes in **httpd 2.4.27**, see the upstream release notes.

1.4. COMPATIBILITY INFORMATION

Red Hat Software Collections 3.0 is available for all supported releases of Red Hat Enterprise Linux 7 on AMD64 and Intel 64 architectures, the 64-bit ARM architecture, IBM z Systems, and IBM POWER, little endian.

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

httpd24 component, BZ#1429006

Since **httpd 2.4.27**, the **mod_http2** module is no longer supported with the default `prefork` Multi-Processing Module (MPM). To enable HTTP/2 support, edit the configuration file at `/opt/rh/httpd24/root/etc/httpd/conf.modules.d/00-mpm.conf` and switch to the **event** or **worker** MPM.

Note that the HTTP/2 server-push feature does not work on the 64-bit ARM architecture, IBM z Systems, and IBM POWER, little endian.

httpd24 component, BZ#1327548

The **mod_ssl** module does not support the ALPN protocol on Red Hat Enterprise Linux 6, or on Red Hat Enterprise Linux 7.3 and earlier. Consequently, clients that support upgrading TLS connections to HTTP/2 only using ALPN are limited to HTTP/1.1 support.

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.

httpd24 component, BZ#1382706

When SELinux is enabled, the **LD_LIBRARY_PATH** environment variable is not passed through to CGI scripts invoked by **httpd**. As a consequence, in some cases it is impossible to invoke

executables from Software Collections enabled in the **/opt/rh/httpd24/service-environment** file from CGI scripts run by **httpd**. To work around this problem, set **LD_LIBRARY_PATH** as desired from within the CGI script.

httpd24 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.

rh-python34, rh-python35, rh-python36 components, BZ#1499990

The **pytz** module, which is used by **Babel** for time zone support, is not included in the rh-python34, rh-python35, and rh-python36 Software Collections. Consequently, when the user tries to import the dates module from **Babel**, a traceback is returned. To work around this problem, install **pytz** through the **pip** package manager from the **pypi** public repository by using the **pip install pytz** command.

rh-python36 component

Certain complex trigonometric functions provided by **numpy** might return incorrect values on the 64-bit ARM architecture, IBM z Systems, and IBM POWER, little endian. The AMD64 and Intel 64 architectures are not affected by this problem.

python27 component, BZ#1330489

The python27-python-pymongo package has been updated to version 3.2.1. 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.

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.

scl-utils component

Due to an architecture-specific macro bug in the scl-utils package, the **<collection>/root/usr/lib64/** directory does not have the correct package ownership on the 64-bit ARM architecture and on IBM POWER, little endian. As a consequence, this directory is not removed when a Software Collection is uninstalled. To work around this problem, manually delete **<collection>/root/usr/lib64/** when removing a Software Collection.

rh-ruby24, rh-ruby23 components

Determination of **RubyGem** installation paths is dependent on the order in which multiple Software Collections are enabled. The required order has been changed since **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-ror50 rh-nodejs6**. To work around this problem, enable the rh-ror50 Software Collection last, for example, **scl enable rh-nodejs6 rh-ror50**.

rh-maven35, rh-maven33 components

When the user has installed both the Red Hat Enterprise Linux system version of maven-local package and the rh-maven35-maven-local package or rh-maven33-maven-local package, **XMvn**, a tool used for building Java RPM packages, run from the rh-maven35 or 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.

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.

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.

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 3.0. Additionally, the mongodb24-build and mongodb24-scldevel packages cannot be installed with Red Hat Software Collections 3.0 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.

mariadb, mysql, postgresql, mongodb components

Red Hat Software Collections 3.0 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/`.

rh-eclipse46 component

When a plug-in from a third-party update site is installed, **Eclipse** sometimes fails to start with a `NullPointerException` in the workspace log file. To work around this problem, restart **Eclipse** with the `-clean` option. For example:

```
~]$ scl enable rh-eclipse46 "eclipse -clean"
```

rh-eclipse46 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.

`rh-eclipse46` 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**.

`rh-thermostat16` component

Due to typos in the desktop application file, users are unable to launch **Thermostat** using the desktop icon. To work around this problem, modify the **/usr/share/applications/rh-thermostat16-thermostat.desktop** file from:

```
[Desktop Entry]
Version=1.0
Type=Application
Name=%{thermostat_desktop_app_name}
Comment=A monitoring and serviceability tool for OpenJDK
Exec=/opt/rh/rh-thermostat16/root/usr/share/thermostat/bin/thermostat
local
Icon=thermostat
```

To:

```
[Desktop Entry]
Version=1.0
Type=Application
Name=Thermostat-1.6
Comment=A monitoring and serviceability tool for OpenJDK
Exec=scl enable rh-thermostat16 "thermostat local"
Icon=rh-thermostat16-thermostat
```

Alternatively, run **Thermostat** from command line:

```
$ scl enable rh-thermostat16 "thermostat local"
```

Other Notes

`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.

rh-eclipse46 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/.

1.6. DEPRECATED FUNCTIONALITY

httpd24 component, BZ#1434053

Previously, in an SSL/TLS configuration requiring name-based SSL virtual host selection, the `mod_ssl` module rejected requests with a `400 Bad Request` error, if the host name provided in the `Host:` header did not match the host name provided in a Server Name Indication (SNI) header. Such requests are no longer rejected if the configured SSL/TLS security parameters are identical between the selected virtual hosts, in-line with the behavior of upstream `mod_ssl`.

CHAPTER 2. INSTALLATION

This chapter describes in detail how to get access to the content set, install Red Hat Software Collections 3.0 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
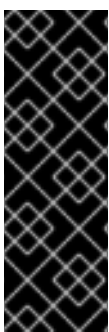
IMPORTANT

Red Hat has shut down the RHN UI. Customers are advised to transition to RHSM to continue receiving support for their subscriptions. As of October 31, 2017, customers will no longer be able to register against RHN Hosted. As of March 31, 2018, customers will no longer receive updates from RHN Hosted.

See https://access.redhat.com/products/red-hat-subscription-management/#migration for more details.

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 3.0 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 at https://access.redhat.com/solutions/392003 for Red Hat Subscription Management or at 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 That Require Enabling of the Optional Channel in Red Hat Enterprise Linux 6

Package from a Software Collection	Required Package from the Optional Channel
devtoolset-6-dyninst-testsuite	glibc-static
devtoolset-7-dyninst-testsuite	glibc-static
rh-git29-git-all	cvsps
rh-git29-git-cvs	cvsps
rh-git29-perl-Git-SVN	perl-YAML, subversion-perl
rh-mariadb101-boost-devel	libicu-devel
rh-mariadb101-boost-examples	libicu-devel
rh-mariadb101-boost-static	libicu-devel
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-mongodb34-boost-devel	libicu-devel
rh-mongodb34-boost-examples	libicu-devel
rh-mongodb34-boost-static	libicu-devel
rh-mongodb34-yaml-cpp-devel	libicu-devel
rh-php56-php-imap	libc-client

Package from a Software Collection	Required Package from the Optional Channel
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 That Require Enabling of the Optional Channel in Red Hat Enterprise Linux 7

Package from a Software Collection	Required Package from the Optional Channel
devtoolset-7-dyninst-testsuite	glibc-static
devtoolset-7-gcc-plugin-devel	libmpc-devel
httpd24-mod_ldap	apr-util-ldap
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-all	cvsps
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 at 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 3.0 requires the removal of any earlier pre-release versions, including Beta releases. If you have installed any previous version of Red Hat Software Collections 3.0, 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 3.0 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 3.0, 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 3.0 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 3.0 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 3.0 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 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 Using Red Hat Software Collections 3 Container Images. For details regarding container images based on Red Hat Software Collections versions 2.4 and earlier, see Using Red Hat Software Collections 2 Container Images .

The following container images are available with Red Hat Software Collections 3.0:

- rhscl/devtoolset-7-toolchain-rhel7

- rhscl/devtoolset-7-perftools-rhel7

- rhscl/httpd-24-rhel7

- rhscl/mariadb-102-rhel7

- rhscl/mongodb-34-rhel7

- rhscl/nginx-112-rhel7

- rhscl/nodejs-8-rhel7

- rhscl/php-71-rhel7

- rhscl/postgresql-96-rhel7

- rhscl/python-36-rhel7

The following container images are based on Red Hat Software Collections 2.4:

- rhscl/devtoolset-6-toolchain-rhel7

- rhscl/devtoolset-6-perftools-rhel7

- rhscl/nginx-110-rhel7

- rhscl/nodejs-6-rhel7

- rhscl/python-27-rhel7

- rhscl/ruby-24-rhel7

- rhscl/ror-50-rhel7

- rhscl/thermostat-16-agent-rhel7 (EOL)

- rhscl/thermostat-16-storage-rhel7 (EOL)

The following container images are based on Red Hat Software Collections 2.3:

- rhscl/mysql-57-rhel7

- rhscl/perl-524-rhel7

- rhscl/php-70-rhel7

- rhscl/redis-32-rhel7

- 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-toolchain-rhel7

- rhscl/devtoolset-4-perftools-rhel7

- 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 (EOL)

- rhscl/varnish-4-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 (EOL)

- 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

Images marked as End of Life (EOL) are no longer supported.

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 4.6.3

The rh-eclipse46 Software Collection, available for Red Hat Enterprise Linux 7, includes **Eclipse 4.6.3**, 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.

> **NOTE**
>
> A new version of **Eclipse** is now available as the rh-eclipse47 component of the Red Hat Developer Tools offering. For more information, see Using Eclipse.

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.
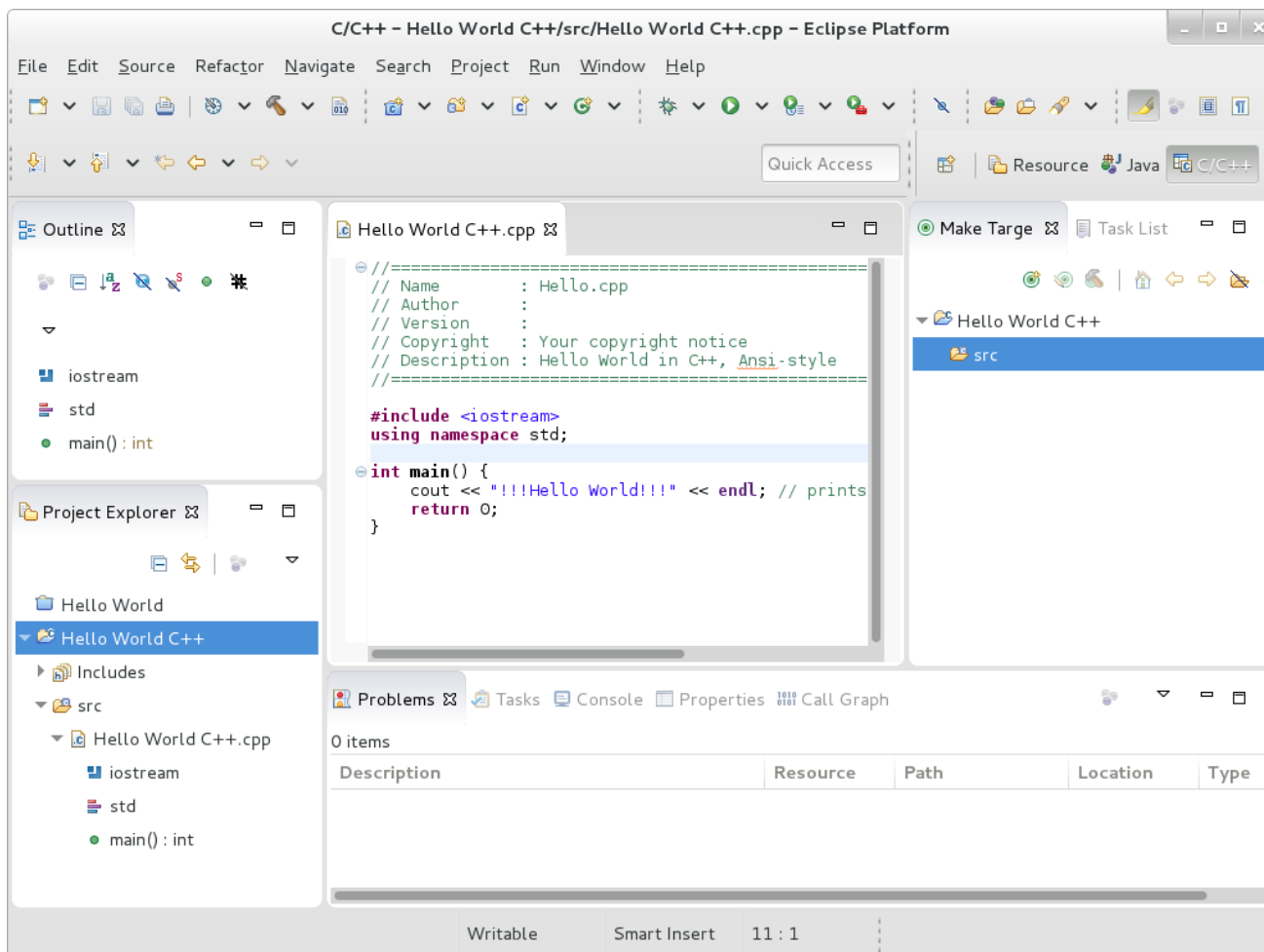
Figure 4.1. Sample Eclipse Session

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.

Package	Description
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**.
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**.

Package	Description
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-7-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-7-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:

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

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

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

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

   3. 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:

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

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

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

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

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

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

   4. 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

- Using Eclipse describing usage of the rh-eclipse47 component of Red Hat Developer Tools.

- 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. RUBY ON RAILS 5.0

Red Hat Software Collections 3.0 provides the rh-ruby24 Software Collection together with the rh-ror50 Collection.

To install **Ruby on Rails 5.0** , type the following command as **root**:

```
yum install rh-ror50
```

Installing any package from the rh-ror50 Software Collection automatically pulls in rh-ruby24 and rh-nodejs6 as dependencies.

The rh-nodejs6 Collection is used by certain gems in an asset pipeline to post-process web resources, for example, **sass** or **coffee-script** source files. Additionally, the **Action Cable** framework uses rh-nodejs6 for handling **WebSockets** in Rails.

To run the **rails s** command without requiring rh-nodejs6, disable the **coffee-rails** and **uglifier** gems in the **Gemfile**.

To run **Ruby on Rails** without **Node.js**, run the following command, which will automatically enable rh-ruby24:

```
scl enable rh-ror50 bash
```

To run **Ruby on Rails** with all features, enable also the rh-nodejs6 Software Collection:

```
scl enable rh-ror50 rh-nodejs6 bash
```

The rh-ror50 Software Collection is supported together with the rh-ruby24 and rh-nodejs6 components.

4.4. MONGODB 3.4

To install the rh-mongodb34 collection, type the following command as **root**:

```
yum install rh-mongodb34
```

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

```
scl enable rh-mongodb34 'mongo'
```

> **NOTE**
>
> The rh-mongodb34-mongo-cxx-driver package has been built with the **-std=gnu++14** option using **GCC** from Red Hat Developer Toolset 6. Binaries using the shared library for the MongoDB C++ Driver that use C++11 (or later) features have to be built also with Red Hat Developer Toolset 6. See C++ compatibility details in the Red Hat Developer Toolset 6 User Guide.

MongoDB 3.4 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-mongodb34-mongod start
```

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

```
chkconfig rh-mongodb34-mongod on
```

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

```
service rh-mongodb34-mongos start
```

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

```
chkconfig rh-mongodb34-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 3.4 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-mongodb34-mongod.service
```

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

```
systemctl enable rh-mongodb34-mongod.service
```

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

```
systemctl start rh-mongodb34-mongos.service
```

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

```
systemctl enable rh-mongodb34-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.

4.5. 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*.

4.6. MAVEN

The rh-maven35 Software Collection, available only for Red Hat Enterprise Linux 7, 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-maven35 Collection, type the following command as **root**:

```
yum install rh-maven35
```

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

```
scl enable rh-maven35 bash
```

Global Maven settings, such as remote repositories or mirrors, can be customized by editing the `/opt/rh/rh-maven35/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.

4.7. 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.

4.8. DATABASE CONNECTORS

Database connector packages provide the database client functionality, which is necessary for local or remote connection to a database server. Table 4.2, "Interoperability Between Languages and Databases" lists Software Collections with language runtimes that include connectors for certain database servers.

Table 4.2. Interoperability Between Languages and Databases

Language (Software Collection)	Database				
	MariaDB	MongoDB	MySQL	PostgreSQL	Redis
rh-nodejs4	✗	✓	✗	✗	✗
rh-nodejs6	✗	✓	✗	✗	✗
rh-nodejs8	✗	✓	✗	✗	✗
rh-perl520	✓	✗	✓	✓	✗
rh-perl524	✓	✗	✓	✓	✗
rh-php56	✓	✓	✓	✓	✗
rh-php70	✓	✗	✓	✓	✗

Language (Software Collection)	Database				
	MariaDB	MongoDB	MySQL	PostgreSQL	Redis
rh-php71	✓	✗	✓	✓	✗
python27	✓	✓	✓	✓	✗
rh-python34	✗	✓	✗	✓	✗
rh-python35	✓	✓	✓	✓	✗
rh-python36	✓	✓	✓	✓	✗
rh-ror50	✓	✓	✓	✓	✗
rh-ror42	✓	✓	✓	✓	✗
rh-ror41	✓	✓	✓	✓	✗
✓	Supported		✗	Unsupported	

CHAPTER 5. MIGRATION

This chapter provides information on migrating to versions of components included in Red Hat Software Collections 3.0.

5.1. MIGRATING TO MARIADB 10.2

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 10.1** has been available as a Software Collection since Red Hat Software Collections 2.2; Red Hat Software Collections 3.0 is distributed with **MariaDB 10.2**.

The rh-mariadb102 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-mariadb102 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-mariadb102 Software Collection while the rh-mariadb101 Collection is still installed and even running.

Note that if you are using **MariaDB 5.5** or **MariaDB 10.0**, it is necessary to upgrade to the rh-mariadb101 Software Collection first, which is described in the Red Hat Software Collections 2.4 Release Notes.

For more information about **MariaDB 10.2**, see the upstream documentation about changes in version 10.2 and about upgrading.

> **NOTE**
>
> The rh-mariadb102 Software Collection supports neither mounting over NFS nor dynamical registering using the `scl register` command.

### 5.1.1. Notable Differences Between the rh-mariadb101 and rh-mariadb102 Software Collections

Major changes in **MariaDB 10.2** are described in Section 1.3.4, "Changes in MariaDB" .

Since **MariaDB 10.2**, behavior of the **SQL_MODE** variable has been changed; see the upstream documentation for details.

Multiple options have changed their default values or have been deprecated or removed. For details, see the Knowledgebase article Migrating from MariaDB 10.1 to the MariaDB 10.2 Software Collection .

The rh-mariadb102 Software Collection includes the rh-mariadb102-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-mariadb102*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-mariadb102* packages. Note that the *-syspaths packages conflict with the corresponding packages from the base Red Hat Enterprise Linux system.

5.1.2. Upgrading from the rh-mariadb101 to the rh-mariadb102 Software Collection
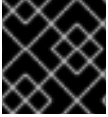
> **IMPORTANT**
>
> Prior to upgrading, back up all your data, including any MariaDB databases.

1. Stop the rh-mariadb101 database server if it is still running.

   Before stopping the server, set the **innodb_fast_shutdown** option to **0**, so that **InnoDB** performs a slow shutdown, including a full purge and insert buffer merge. Read more about this option in the upstream documentation. This operation can take a longer time than in case of a normal shutdown.

   ```
   mysql -uroot -p -e "SET GLOBAL innodb_fast_shutdown = 0"
   ```

   Stop the rh-mariadb101 server.

   ```
   service rh-mariadb101-mariadb stop
   ```

2. Install the rh-mariadb102 Software Collection.

   ```
   yum install rh-mariadb102-mariadb-server
   ```

   Note that it is possible to install the rh-mariadb102 Software Collection while the rh-mariadb101 Software Collection is still installed because these Collections do not conflict.

3. Inspect configuration of rh-mariadb102, which is stored in the **/etc/opt/rh/rh-mariadb102/my.cnf** file and the **/etc/opt/rh/rh-mariadb102/my.cnf.d/** directory. Compare it with configuration of rh-mariadb101 stored in **/etc/opt/rh/rh-mariadb101/my.cnf** and **/etc/opt/rh/rh-mariadb101/my.cnf.d/** and adjust it if necessary.

4. All data of the rh-mariadb101 Software Collection is stored in the **/var/opt/rh/rh-mariadb101/lib/mysql/** directory unless configured differently. Copy the whole content of this directory to **/var/opt/rh/rh-mariadb102/lib/mysql/**. You can move the content but remember to back up your data before you continue to upgrade. Make sure the data are owned by the **mysql** user and SELinux context is correct.

5. Start the rh-mariadb102 database server.

   ```
   service rh-mariadb102-mariadb start
   ```

6. Perform the data migration.

   ```
   scl enable rh-mariadb102 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-mariadb102 -- mysql_upgrade -p
   ```

5.2. MIGRATING TO MONGODB 3.4

Red Hat Software Collections 3.0 is released with **MongoDB 3.4,** provided by the rh-mongodb34

Software Collection.

5.2.1. Notable Differences Between MongoDB 3.2 and MongoDB 3.4

General Changes

The rh-mongodb34 Software Collection introduces various general changes. Major changes are listed in Section 1.3.6, "Changes in MongoDB" and in the Knowledgebase article Migrating from MongoDB 3.2 to MongoDB 3.4.

For detailed changes, see the upstream release notes.

In addition, this Software Collection includes the rh-mongodb34-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-mongodb34*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-mongodb34* packages.

Compatibility Changes

MongoDB 3.4 includes various minor changes that can affect compatibility with previous versions of **MongoDB**. For details, see the Knowledgebase article Migrating from MongoDB 3.2 to MongoDB 3.4 and the upstream documentation.

Notably, the following **MongoDB 3.4** features are backwards incompatible and require that the version is set to `3.4` using the `featureCompatibilityVersion` command:

- Support for creating read-only views from existing collections or other views

- Index version `v: 2`, which adds support for collation, decimal data and case-insensitive indexes

- Support for the `decimal128` format with the new `decimal` data type

For details regarding backward incompatible changes in **MongoDB 3.4**, see the upstream release notes.

5.2.2. Upgrading from the rh-mongodb32 to the rh-mongodb34 Software Collection

Note that once you have upgraded to **MongoDB 3.4** and started using new features, cannot downgrade to version 3.2.7 or earlier. You can only downgrade to version 3.2.8 or later.

> **IMPORTANT**
>
> Before migrating from the rh-mongodb32 to the rh-mongodb34 Software Collection, back up all your data, including any **MongoDB** databases, which are by default stored in the `/var/opt/rh/rh-mongodb32/lib/mongodb/` directory. In addition, see the compatibility changes to ensure that your applications and deployments are compatible with **MongoDB 3.4**.

To upgrade to the rh-mongodb34 Software Collection, perform the following steps.

1. Install the **MongoDB** servers and shells from the rh-mongodb34 Software Collections:

   ```
   ~]# yum install rh-mongodb34
   ```

2. Stop the **MongoDB 3.2** server:

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

Use the `service rh-mongodb32-mongodb stop` command on a Red Hat Enterprise Linux 6 system.

3. Copy your data to the new location:

```
~]# cp -a /var/opt/rh/rh-mongodb32/lib/mongodb/* /var/opt/rh/rh-mongodb34/lib/mongodb/
```

4. Configure the `rh-mongodb34-mongod` daemon in the `/etc/opt/rh/rh-mongodb34/mongod.conf` file.

5. Start the **MongoDB 3.4** server:

```
~]# systemctl start rh-mongodb34-mongod.service
```

On Red Hat Enterprise Linux 6, use the `service rh-mongodb34-mongodb start` command instead.

6. Enable backwards-incompatible features:

```
~]$ scl enable rh-mongodb34 'mongo --host localhost --port 27017
admin' --eval 'db.adminCommand( { setFeatureCompatibilityVersion:
"3.4" } )'
```

If the **mongod** server is configured with enabled access control, add the `--username` and `--password` options to **mongo** command.

Note that it is recommended to run the deployment after the upgrade without enabling these features first.

For detailed information about upgrading, see the upstream 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 9.6

Red Hat Software Collections 3.0 is distributed with **PostgreSQL 9.6**, 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 any version of **PostgreSQL** released in previous versions of Red Hat Software Collections. 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 9.5 and PostgreSQL 9.6

The most notable changes between **PostgreSQL 9.5** and **PostgreSQL 9.6** are described in the upstream release notes.

The rh-postgresql96 Software Collection includes the rh-postgresql96-syspaths package, which installs packages that provide system-wide wrappers for binaries, scripts, manual pages, and other. After installing the rh-postgreqsl96*-syspaths packages, users are not required to use the `scl enable` command for correct functioning of the binaries and scripts provided by the rh-postgreqsl96* packages. Note that the *-syspaths packages conflict with the corresponding packages from the base Red Hat Enterprise Linux system.

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-postgresql95, and rh-postgresql96 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; the paths for the rh-postgresql94 Software Collection are analogous to rh-postgresql95.

Table 5.1. Diferences in the PostgreSQL paths

Content	postgresql	postgresql92	rh-postgresql95	rh-postgresql96
Executables	/usr/bin/	/opt/rh/postgresql92/root/usr/bin/	/opt/rh/rh-postgresql95/root/usr/bin/	/opt/rh/rh-postgresql96/root/usr/bin/
Libraries	/usr/lib64/	/opt/rh/postgresql92/root/usr/lib64/	/opt/rh/rh-postgresql95/root/usr/lib64/	/opt/rh/rh-postgresql96/root/usr/lib64/
Documentation	/usr/share/doc/postgresql/html/	/opt/rh/postgresql92/root/usr/share/doc/postgresql/html/	/opt/rh/rh-postgresql95/root/usr/share/doc/postgresql/html/	/opt/rh/rh-postgresql96/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-postgresql95/root/usr/share/doc/postgresql-docs/	/opt/rh/rh-postgresql96/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-postgresql95/root/usr/share/doc/postgresql-contrib/	/opt/rh/rh-postgresql96/root/usr/share/doc/postgresql-contrib/

Content	postgresql	postgresql92	rh-postgresql95	rh-postgresql96
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-postgresql95/lib/pgsql/data/	/var/opt/rh/rh-postgresql96/lib/pgsql/data/
Backup area	/var/lib/pgsql/backups/	/opt/rh/postgresql92/root/var/lib/pgsql/backups/	/var/opt/rh/rh-postgresql95/lib/pgsql/backups/	/var/opt/rh/rh-postgresql96/lib/pgsql/backups/
Templates	/usr/share/pgsql/	/opt/rh/postgresql92/root/usr/share/pgsql/	/opt/rh/rh-postgresql95/root/usr/share/pgsql/	/opt/rh/rh-postgresql96/root/usr/share/pgsql/
Procedural Languages	/usr/lib64/pgsql/	/opt/rh/postgresql92/root/usr/lib64/pgsql/	/opt/rh/rh-postgresql95/root/usr/lib64/pgsql/	/opt/rh/rh-postgresql96/root/usr/lib64/pgsql/
Development Headers	/usr/include/pgsql/	/opt/rh/postgresql92/root/usr/include/pgsql/	/opt/rh/rh-postgresql95/root/usr/include/pgsql/	/opt/rh/rh-postgresql96/root/usr/include/pgsql/
Other shared data	/usr/share/pgsql/	/opt/rh/postgresql92/root/usr/share/pgsql/	/opt/rh/rh-postgresql95/root/usr/share/pgsql/	/opt/rh/rh-postgresql96/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-postgresql95/root/usr/lib64/pgsql/test/regress/ (in the -test package)	/opt/rh/rh-postgresql96/root/usr/lib64/pgsql/test/regress/ (in the -test package)

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. For differences between **PostgreSQL 9.4** and **PostgreSQL 9.5**, refer to Red Hat Software Collections 2.2 Release Notes.

5.4.2. Migrating from a Red Hat Enterprise Linux System Version of PostgreSQL to the PostgreSQL 9.6 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-postgresql96 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 9.6, 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-postgresql96/lib/pgsql/data/** does not exist:

   ```
   file /var/opt/rh/rh-postgresql96/lib/pgsql/data/
   ```

   If you are running a fresh installation of **PostgreSQL 9.6**, 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-postgresql96/lib/pgsql/data{,-scl-backup}
   ```

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

   ```
   scl enable rh-postgresql96 -- postgresql-setup --upgrade
   ```

   Alternatively, you can use the **/opt/rh/rh-postgresql96/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-postgresql96-postgresql.log** log file to find out if any problems occurred during the upgrade.

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

```
service rh-postgresql96-postgresql start
```

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

```
su - postgres -c 'scl enable rh-postgresql96
~/analyze_new_cluster.sh'
```

6. Optionally, you can configure the PostgreSQL 9.6 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 9.6 server, type as **root**:

```
chkconfig rh-postgresql96-postgresql on
```

7. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql96/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-postgresql96-postgresql -- postgresql-setup --initdb
```

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

```
service rh-postgresql96-postgresql start
```

6. Import data from the previously created SQL file:

```
su - postgres -c 'scl enable rh-postgresql96 "psql -f
~/pgdump_file.sql postgres"'
```

7. Optionally, you can configure the PostgreSQL 9.6 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 9.6 server, type as **root**:

```
chkconfig rh-postgresql96-postgresql on
```

8. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql96/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 9.5 Software Collection to the PostgreSQL 9.6 Software Collection

To migrate your data from the rh-postgresql95 Software Collection to the rh-postgresql96 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.

> **IMPORTANT**
>
> Before migrating your data from **PostgreSQL 9.5** to **PostgreSQL 9.6**, 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-postgresql95/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-postgresql95-postgresql stop
```

To verify that the server is not running, type:

```
service rh-postgresql95-postgresql status
```

2. Verify that the old directory **/var/opt/rh/rh-postgresql95/lib/pgsql/data/** exists:

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

and back up your data.

3. Verify that the new data directory **/var/opt/rh/rh-postgresql96/lib/pgsql/data/** does not exist:

```
file /var/opt/rh/rh-postgresql96/lib/pgsql/data/
```

If you are running a fresh installation of **PostgreSQL 9.6,** 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-postgresql96/lib/pgsql/data{,-scl-backup}
```

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

```
scl enable rh-postgresql96 -- postgresql-setup --upgrade --upgrade-
from=rh-postgresql95-postgresql
```

Alternatively, you can use the **/opt/rh/rh-postgresql96/root/usr/bin/postgresql-setup --upgrade --upgrade-from=rh-postgresql95-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-postgresql96-postgresql.log** log file to find out if any problems occurred during the upgrade.

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

```
service rh-postgresql96-postgresql start
```

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

```
su - postgres -c 'scl enable rh-postgresql96
~/analyze_new_cluster.sh'
```

6. Optionally, you can configure the PostgreSQL 9.6 server to start automatically at boot time. To disable the old PostgreSQL 9.5 server, type the following command as **root:**

```
chkconfig rh-postgresql95-postgreqsql off
```

To enable the PostgreSQL 9.6 server, type as **root:**

```
chkconfig rh-postgresql96-postgresql on
```

7. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql96/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-postgresql95-postgresql start
```

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

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

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

   ```
   service rh-postgresql95-postgresql stop
   ```

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

   ```
   scl enable rh-postgresql96-postgresql -- postgresql-setup --initdb
   ```

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

   ```
   service rh-postgresql96-postgresql start
   ```

6. Import data from the previously created SQL file:

   ```
   su - postgres -c 'scl enable rh-postgresql96 "psql -f
   ~/pgdump_file.sql postgres"'
   ```

7. Optionally, you can configure the PostgreSQL 9.6 server to start automatically at boot time. To disable the old PostgreSQL 9.5 server, type the following command as **root**:

   ```
   chkconfig rh-postgresql95-postgresql off
   ```

   To enable the PostgreSQL 9.6 server, type as **root**:

   ```
   chkconfig rh-postgresql96-postgresql on
   ```

8. If your configuration differs from the default one, make sure to update configuration files, especially the **/var/opt/rh/rh-postgresql96/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. The same applies to migration from the rh-postgresql94 Software Collection, which is described in Red Hat Software Collections 2.2 Release Notes.

5.5. MIGRATING TO NGINX 1.12

The rh-nginx112 Software Collection is available only for Red Hat Enterprise Linux 7.4 and later versions.

The root directory for the rh-nginx112 Software Collection is located in **/opt/rh/rh-nginx112/root/**. The error log is stored in **/var/opt/rh/rh-nginx112/log/nginx** by default.

Configuration files are stored in the **/etc/opt/rh/rh-nginx112/nginx/** directory. Configuration files in **nginx 1.12** have the same syntax and largely the same format as previous **nginx** Software Collections.

Configuration files (with a `.conf` extension) in the **`/etc/opt/rh/rh-nginx112/nginx/default.d/`** directory are included in the default server block configuration for port **80**.

> **IMPORTANT**
>
> Before upgrading from **nginx 1.10** to **nginx 1.12**, back up all your data, including web pages located in the **`/opt/rh/nginx110/root/`** tree and configuration files located in the **`/etc/opt/rh/nginx110/nginx/`** tree.

If you have made any specific changes, such as changing configuration files or setting up web applications, in the **`/opt/rh/nginx110/root/`** tree, replicate those changes in the new **`/opt/rh/rh-nginx112/root/`** and **`/etc/opt/rh/rh-nginx112/nginx/`** directories, too.

You can use this procedure to upgrade directly from **nginx 1.4**, **nginx 1.6**, **nginx 1.8**, or **nginx 1.10** to **nginx 1.12**. Use the appropriate paths 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 3.0 and Red Hat Enterprise Linux.

6.1. RED HAT PRODUCT DOCUMENTATION

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

- Red Hat Software Collections 3.0 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 7.0 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 7.0 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 book provides information on how to use container images based on Red Hat Software Collections. The available container images include applications, daemons, databases, as well as the Red Hat Developer Toolset container images. 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.

6.2. 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.

6.3. RED HAT DEVELOPERS PORTAL

Red Hat Developers Portal provides an overview of Red Hat Software Collections and offers getting started content, including *Hello world!* examples.

APPENDIX A. REVISION HISTORY

Revision 3.0-9   **Mon Oct 30 2017**   **Lenka Špačková**
   Added information regarding database connectors.

Revision 3.0-8   **Tue Oct 24 2017**   **Lenka Špačková**
   Release of Red Hat Software Collections 3.0 Release Notes.

Revision 3.0-7   **Tue Oct 03 2017**   **Lenka Špačková**
   Release of Red Hat Software Collections 3.0 Beta Release Notes.