

Fedora Contributor Documentation

Software Collections Guide

A guide to Software Collections for Fedora and Enterprise Linux



Petr Kovář

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Important

The Software Collections Guide is deprecated and is no longer maintained. For up-to-date documentation on Software Collection packaging, see the *softwarecollections.org Packaging Guide* at <https://www.softwarecollections.org/en/docs/guide/>.

The Software Collections Guide provides an explanation of Software Collections and details how to build and package them. Developers and system administrators who have a basic understanding of software packaging with RPM packages, but who are new to the concept of Software Collections, can use this Guide to get started with Software Collections.

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Preface

1. Acknowledgments

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Introducing Software Collections

This chapter introduces you to the concept and usage of Software Collections or SCLs for short.

1.1. Why Package Software with RPM?

The RPM Package Manager (RPM) is a package management system that runs on Fedora and Enterprise Linux. RPM makes it easier for you to distribute, manage, and update software that you create for Fedora or Enterprise Linux. Many software vendors distribute their software via a conventional archive file (such as a tarball). However, there are several advantages in packaging software into RPM packages. These advantages are outlined below.

With RPM, you can:

Install, reinstall, remove, upgrade and verify packages.

Users can use standard package management tools (for example **Yum** or **PackageKit**) to install, reinstall, remove, upgrade and verify your RPM packages.

Use a database of installed packages to query and verify packages.

Because RPM maintains a database of installed packages and their files, users can easily query and verify packages on their system.

Use metadata to describe packages, their installation instructions, and so on.

Each RPM package includes metadata that describes the package's components, version, release, size, project URL, installation instructions, and so on.

Package pristine software sources into source and binary packages.

RPM allows you to take pristine software sources and package them into source and binary packages for your users. In source packages, you have the pristine sources along with any patches that were used, plus complete build instructions. This design eases the maintenance of the packages as new versions of your software are released.

Add packages to Yum repositories.

You can add your package to a **Yum** repository that enables clients to easily find and deploy your software.

Digitally sign your packages.

Using a GPG signing key, you can digitally sign your package so that users are able to verify the authenticity of the package.

For in-depth information on what is RPM and how to use it, refer to the [Fedora 18 System Administrator's Guide](http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html)¹.

1.2. What Are Software Collections?

With Software Collections, you can build and concurrently install multiple versions of the same software components on your system. Software Collections have no impact on the system versions of the packages installed by any of the conventional RPM package management utilities.

¹ http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html

Software Collections:

Do not overwrite system files

Software Collections are distributed as a set of several components, which provide their full functionality without overwriting system files.

Are designed to avoid conflicts with system files

Software Collections make use of a special file system hierarchy to avoid possible conflicts between a single Software Collection and the base system installation.

Require no changes to the RPM package manager

Software Collections require no changes to the RPM package manager present on the host system.

Need only minor changes to the spec file

To convert a conventional package to a single Software Collection, you only need to make minor changes to the package spec file.

Allow you to build a conventional package and a Software Collection package with a single spec file

With a single spec file, you can build both the conventional package and the Software Collection package.

Allow you to use a spec file from one Software Collection to build a different Software Collection

You can use a single spec file from one Software Collection to build a different Software Collection.

Uniquely name all included packages

With Software Collection's namespace, all packages included in the Software Collection are uniquely named.

Do not conflict with updated packages

Software Collection's namespace ensures that updating packages on your system causes no conflicts.

Can depend on other Software Collections

Because one Software Collection can depend on another, you can define multiple levels of dependencies.

1.3. Enabling Support for Software Collections

To enable support for Software Collections on your system so that you can enable and build Software Collections, you need to have installed the packages *scl-utils* and *scl-utils-build*.

If the packages *scl-utils* and *scl-utils-build* are not already installed on your system, you can install them by typing the following at a shell prompt as root:

```
yum install scl-utils scl-utils-build
```

The *scl-utils* package provides the **scl** tool that lets you enable Software Collections on your system. For more information on enabling Software Collections, refer to [Section 1.6, “Enabling a Software Collection”](#).

The *scl-utils-build* package provides macros that are essential for building Software Collections. For more information on building Software Collections, refer to [Section 2.12, “Building a Software Collection”](#).

1.4. Installing a Software Collection

To ensure that a Software Collection is on your system, install the so-called metapackage of the Software Collection. Thanks to Software Collections being fully compatible with the RPM Package Manager, you can use conventional tools like **Yum** or **PackageKit** for this task.

For example, to install a Software Collection with the metapackage named **software_collection_1**, run the following command:

```
yum install software_collection_1
```

This command will automatically install all the packages in the Software Collection that are essential for the user to perform most common tasks with the Software Collection.

Software Collections allow you to only install a subset of packages you intend to use. For example, to use the Ruby interpreter from the ruby193 Software Collection, you only need to install a package *ruby193-ruby* from that Software Collection.

If you install an application that depends on a Software Collection, that Software Collection will be installed along with the rest of the application's dependencies.

For detailed information on Software Collection metapackages, see [Section 2.7.1, “Metapackage”](#).

For detailed information on **Yum** and **PackageKit** usage, see the [Fedora 18 System Administrator's Guide](#)².

1.5. Listing Installed Software Collections

To get a list of Software Collections that are currently installed on the system, run the following command:

```
scl --list
```

1.6. Enabling a Software Collection

The **scl** tool is used to enable a Software Collection and to run applications in the Software Collection environment.

General usage of the **scl** tool can be described using the following syntax:

```
scl action software_collection_1 software_collection_2 command
```

When executing the command, the **scl** tool creates a child process (subshell) of the current shell. Running the command again then creates a subshell of the subshell.

See [Section 1.7, “Listing Enabled Software Collections”](#) for information on how to list enabled Software Collections for the current subshell.

Note that you have to disable an enabled Software Collection first to be able to enable it again. To disable the Software Collection, exit the subshell created when enabling the Software Collections.

² http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html

When using the **scl** tool to enable a Software Collection, you can only perform one action with the enabled Software Collection at a time. The enabled Software Collection must be disabled first before performing another action.

1.6.1. Running an Application Directly

For example, to directly run **Perl** with the **--version** option in the Software Collection named **software_collection_1**, execute the following command:

```
scl enable software_collection_1 'perl --version'
```

Alternatively, you can create a wrapper script that shortens the commands for running applications in the Software Collection environment. For more information on wrappers, see [Section 3.3, “Packaging Wrappers for Software Collections”](#).

1.6.2. Running a Shell with Multiple Software Collections Enabled

To run the **Bash** shell in the environment with multiple Software Collections enabled, execute the following command:

```
scl enable software_collection_1 software_collection_2 bash
```

The command above enables two Software Collections, named **software_collection_1** and **software_collection_2**.

1.6.3. Running Commands Stored in a File

To execute a number of commands, which are stored in a file, in the Software Collection environment, run the following command:

```
cat cmd | scl enable software_collection_1 -
```

The command above executes commands, which are stored in the **cmd** file, in the environment of the Software Collection named **software_collection_1**.

1.7. Listing Enabled Software Collections

To get a list of Software Collections that are enabled in the current session, print the **\$X_SCLS** environment variable by running the following command:

```
echo $X_SCLS
```

1.8. Uninstalling a Software Collection

You can use conventional tools like **Yum** or **PackageKit** when uninstalling a Software Collection because Software Collections are fully compatible with the RPM Package Manager. For example, to uninstall all packages and subpackages that are part of a Software Collection named **software_collection_1**, run the following command:

```
yum remove software_collection_1\*
```

You can also use the **yum remove** command to remove the **scl** utility.

For detailed information on **Yum** and **PackageKit** usage, refer to the [Fedora 18 System Administrator's Guide](#)³.

³ http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html

Packaging Software Collections

This chapter introduces you to packaging Software Collections.

2.1. Creating Your Own Software Collections

In general, you can use one of the following two approaches to deploy an application that depends on an existing Software Collection:

- install all required Software Collections and packages manually and then deploy your application, or
- create a new Software Collection for your application.

When creating a new Software Collection for your application:

Create a Software Collection metapackage

Each Software Collection includes a metapackage, which installs a subset of the Software Collection's packages that are essential for the user to perform most common tasks with the Software Collection. See [Section 2.7.1, “Metapackage”](#) for more information on creating metapackages.

Consider specifying the location of the Software Collection root directory

You are advised to specify the location of the Software Collection root directory by setting the `%_scl_prefix` macro in the Software Collection spec file. For more information, see [Section 2.3, “The Software Collection Root Directory”](#).

Consider prefixing the name of your Software Collection packages

You are advised to prefix the name of your Software Collection packages with the vendor and Software Collection's name. For more information, see [Section 2.4, “The Software Collection Prefix”](#).

Specify all Software Collections and other packages required by your application as dependencies

Ensure that all Software Collections and other packages required by your application are specified as dependencies of your Software Collection. For more information, see [Section 2.11, “Making a Software Collection Depend on Another Software Collection”](#).

Convert existing conventional packages or create new Software Collection packages

Ensure that all macros in your Software Collection package spec files use conditionals. See [Section 2.9, “Converting a Conventional Spec File”](#) for more information on how to convert an existing package spec file.

Build your Software Collection

After you create the Software Collection metapackage and convert or create packages for your Software Collection, you can build the Software Collection with the **rpmbuild** utility. For more information, see [Section 2.12, “Building a Software Collection”](#).

2.2. The File System Hierarchy

The root directory of Software Collections is normally located in the `/opt/` directory to avoid possible conflicts between Software Collections and the base system installation. The use of the `/opt/` directory is recommended by the Filesystem Hierarchy Standard (FHS).

Below is an example of the file system hierarchy layout with two Software Collections, `software_collection_1` and `software_collection_2`:

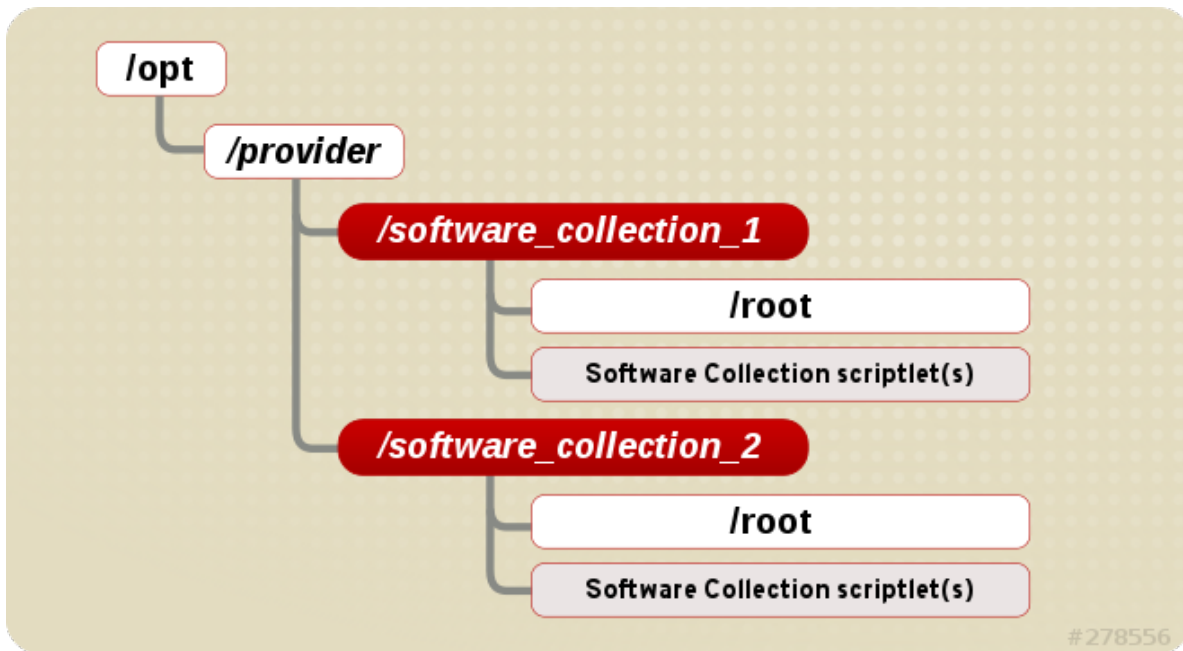


Figure 2.1. The Software Collection File System Hierarchy

As you can see above, each of the Software Collections directories contains the Software Collection root directory, and one or more Software Collection scriptlets. For more information on the Software Collection scriptlets, refer to [Section 2.6, “Software Collection Scriptlets”](#).

2.3. The Software Collection Root Directory

You can change the location of the root directory by setting the `%_scl_prefix` macro in the spec file, as in the following example:

```
%global _scl_prefix /opt/provider
```

where *provider* is the provider (vendor) name registered, where applicable, with the Linux Foundation and the subordinated Linux Assigned Names and Numbers Authority (LANANA), in conformance with the Filesystem Hierarchy Standard.

Each organization or project that builds and distributes Software Collections should use its own provider name, which conforms to the Filesystem Hierarchy Standard (FHS) and avoids possible conflicts between Software Collections and the base system installation.

You are advised to make the file system hierarchy conform to the following layout:

```
/opt/provider/prefix-application-version/
```

For more information on the Filesystem Hierarchy Standard, see <http://www.pathname.com/fhs/>.

For more information on the Linux Assigned Names and Numbers Authority, see <http://www.lanana.org/>.

2.4. The Software Collection Prefix

When naming your Software Collection, you are advised to prefix the name of your Software Collection as described below in order to avoid possible name conflicts with the system versions of the packages that are part of your Software Collection.

The Software Collection prefix consists of two parts:

- the *provider* part, which defines the provider's name, and
- the name of the Software Collection itself.

These two parts of the Software Collection prefix are separated by an underscore (`_`), as in the following example:

```
myorganization_ruby193
```

In this example, *myorganization* is the provider's name, and *ruby193* is the name of the Software Collection.

While it is ultimately a vendor's or distributor's decision whether to specify the provider's name in the prefix or not, specifying it is highly recommended. A notable exception are Software Collections provided by Red Hat, they do not specify the provider's name in their prefixes.

2.5. Software Collection Package Names

The Software Collection package name consists of two parts:

- the *prefix* part, discussed in [Section 2.4, “The Software Collection Prefix”](#), and
- the name and version number of the application that is a part of the Software Collection.

These two parts of the Software Collection package name are separated by a dash (`-`), as in the following example:

```
myorganization_ruby193-foreman-1.1
```

In this example, *myorganization_ruby193* is the prefix, and *foreman-1.1* is the name and version number of the application.

2.6. Software Collection Scriptlets

The Software Collection scriptlets are simple shell scripts that change the current system environment so that the group of packages in the Software Collection is preferred over the corresponding group of conventional packages installed on the system.

To utilize the Software Collection scriptlets, use the **scl** tool that is part of the *scl-utils* package. For more information on **scl**, refer to [Section 1.6, “Enabling a Software Collection”](#).

A single Software Collection can include multiple Software Collection scriptlets. These scriptlets are located in the `/opt/provider/software_collection/` directory in your Software Collection package. If you only need to distribute a single scriptlet in your Software Collection, it is highly recommended that you use **enable** as the name for that scriptlet. When the user runs a command in the Software Collection environment by executing **scl enable software_collection command**, the `/opt/provider/software_collection/enable` scriptlet is then used to update search paths, and so on.

Note that Software Collection scriptlets can only set the system environment in a subshell that is created by running the **scl enable** command. The subshell is only active for the time the command is being performed.

2.7. Package Layout

Each Software Collection's layout consists of the metapackage, which installs a subset of other packages, and a number of the Software Collection's packages, which are installed within the Software Collection namespace.

2.7.1. Metapackage

Each Software Collection includes a metapackage, which installs a subset of the Software Collection's packages that are essential for the user to perform most common tasks with the Software Collection. For example, the essential packages can provide the Perl language interpreter, but no Perl extension modules. The metapackage contains a basic file system hierarchy and delivers a number of the Software Collection's scriptlets.

The purpose of the metapackage is to make sure that all essential packages in the Software Collection are properly installed and that it is possible to enable the Software Collection.

The metapackage produces the following packages that are also part of the Software Collection:

The main package: `%scl`

The main package in the Software Collection contains dependencies of the base packages, which are included in the Software Collection. The main package does not contain any files.

When specifying dependencies for your Software Collection's packages, ensure that no other package in your Software Collection depends on the main package. The purpose of the main package is to install only those packages that are essential for the user to perform most common tasks with the Software Collection.

Normally, the main package does not specify any build time dependencies (for instance, packages that are only build time dependencies of another Software Collection's packages).

For example, if the name of the Software Collection is **myorganization_ruby193**, then the main package macro is expanded to:

```
myorganization_ruby193
```

The runtime subpackage: *name*-runtime

The runtime subpackage in the Software Collection owns the Software Collection's file system and delivers the Software Collection's scriptlets.

For example, if the name of the Software Collection is **myorganization_ruby193**, then the runtime subpackage macro is expanded to:

```
myorganization_ruby193-runtime
```

The build subpackage: *name*-build

The build subpackage in the Software Collection delivers the Software Collection's build configuration. The build subpackage is optional and can be excluded from the Software Collection.

For example, if the name of the Software Collection is **myorganization_ruby193**, then the build subpackage macro is expanded to:

```
myorganization_ruby193-build
```

The `scldevel` subpackage: *name-scldevel*

The `scldevel` subpackage in the `%scl` Software Collection contains development files, which are useful when developing packages of another Software Collection that depends on the `%scl` Software Collection. The `scldevel` subpackage is optional and can be excluded from the `%scl` Software Collection.

For example, if the name of the Software Collection is `myorganization_ruby193`, then the `scldevel` subpackage macro is expanded to:

```
myorganization_ruby193-scldevel
```

For more information about the `scldevel` subpackage, see [Section 4.1, “Providing an `scldevel` Subpackage”](#).

2.7.2. Creating a Metapackage

When creating a new metapackage:

- You are advised to add **Requires: `scl-utils-build`** to the *build* subpackage.
- Add any macros you need to use to the **macros.%{`scl`}-config** file in the *build* subpackage.
- You are not required to use conditionals for Software Collection-specific macros in the metapackage.
- Consider specifying all packages in your Software Collection that are essential for the Software Collection run time as dependencies of the metapackage. That way you can ensure that the packages are installed with the Software Collection metapackage.
- Include any path redefinition that the packages in your Software Collection may require in the **enable** scriptlet.

For example, to run Software Collection binary files, add **PATH=%{_bindir}\\${PATH}+:\\${PATH}}** to the **enable** scriptlet.

- Always make sure that the metapackage contains the **%setup** macro in the **%prep** section, otherwise building the Software Collection will fail. If you do not need to use a particular option with the **%setup** macro, add the **%setup -c -T** command to the **%prep** section.

This is because the **%setup** macro defines and creates the **%buildsubdir** directory, which is normally used for storing temporary files at build time. If you do not define **%setup** in your Software Collection packages, files in the **%buildsubdir** directory will be overwritten, causing the build to fail.

Example of the Metapackage

To get an idea of what a typical Software Collection metapackage looks like, see the following example:

```
%global scl software_collection
%scl_package %scl
%global _scl_prefix /opt/myorganization

Summary: Package that installs %scl
Name: %scl_name
Version: 1
Release: 1%{?dist}
License: GPLv2+
```

```
Requires: %{scl_prefix}less
BuildRequires: scl-utils-build

%description
This is the main package for %scl Software Collection.

%package runtime
Summary: Package that handles %scl Software Collection.
Requires: scl-utils

%description runtime
Package shipping essential scripts to work with %scl Software Collection.

%package build
Summary: Package shipping basic build configuration
Requires: scl-utils-build

%description build
Package shipping essential configuration macros to build %scl Software Collection.

%package scldevel
Summary: Package shipping development files for %scl

%description scldevel
Package shipping development files, especially useful for development of
packages depending on %scl Software Collection.

%prep
%setup -c -T

%install
%scl_install

cat >> %{buildroot}%{_scl_scripts}/enable << EOF
export PATH=%{_bindir}\${PATH:+:\${PATH}}
export LD_LIBRARY_PATH=%{_libdir}\${LD_LIBRARY_PATH:+:\${LD_LIBRARY_PATH}}
export MANPATH=%{_mandir}:\${MANPATH}
export PKG_CONFIG_PATH=%{_libdir}/pkgconfig\${PKG_CONFIG_PATH:+:\${PKG_CONFIG_PATH}}
EOF

cat >> %{buildroot}%{_root_sysconfdir}/rpm/macros.%{scl_name_base}-scldevel << EOF
%%scl_%{scl_name_base} %{scl}
%%scl_prefix_%{scl_name_base} %{scl_prefix}
EOF

# Install the generated man page
mkdir -p %{buildroot}%{_mandir}/man7/
install -p -m 644 %{scl_name}.7 %{buildroot}%{_mandir}/man7/

%files

%files runtime -f filesystem
%scl_files

%files build
%{_root_sysconfdir}/rpm/macros.%{scl}-config

%files scldevel
%{_root_sysconfdir}/rpm/macros.%{scl_name_base}-scldevel

%changelog
* Fri Aug 30 2013 John Doe <jdoe@example.com> 1-1
- Initial package
```

2.8. Software Collection Macros

The Software Collection packaging macro **scl** defines where to relocate the Software Collection's file structure. The relocated file structure is a file system used exclusively by the Software Collection.

The **%scl_package** macro defines files ownership for the Software Collection's metapackage and provides additional packaging macros to use in the Software Collection environment.

To be able to build a conventional package and a Software Collection package with a single spec file, prefix the Software Collection macros with **%{?scl:macro}**, as in the following example:

```
%{?scl:Requires:%scl_runtime}
```

In the example above, the **%scl_runtime** macro is the value of the **Requires** tag. Both the macro and the tag use the **%{?scl:}** prefix.

2.8.1. Macros Specific to a Software Collection

The table below shows a list of all macros specific to a particular Software Collection. All the macros have default values that you will not need to change in most cases.

Table 2.1. Software Collection Specific Macros

Macro	Description	Example value
%scl_name	name of the Software Collection	software_collection_1
%scl_prefix	name of the Software Collection with a dash appended at the end	software_collection_1-
%pkg_name	name of the original package	perl
_%scl_prefix	root of the Software Collection (not package's root)	/opt/provider/
_%scl_scripts	location of Software Collection's scriptlets	/opt/provider/ software_collection_1/
_%scl_root	installation root (install-root) of the package	/opt/provider/ software_collection_1/ root/
%scl_require_package software_collection_1 package_2	depend on a particular package from a specific Software Collection	software_collection_1- package_2

2.8.2. Macros Not Specific to a Software Collection

The table below shows a list of macros that are not specific to a particular Software Collection. Because these macros are not relocated and do not point to the Software Collection file system, they allow you to point to the system root file system. These macros use **_root** as a prefix.

All the macros have default values that you will not need to change in most cases.

Table 2.2. Software Collection Non-Specific Macros

Macro	Description	Relocated	Example value
_%root_prefix	Software Collection's _%prefix macro	no	/usr/

Macro	Description	Relocated	Example value
<code>%_root_exec_prefix</code>	Software Collection's <code>%_exec_prefix</code> macro	no	<code>/usr/</code>
<code>%_root_bindir</code>	Software Collection's <code>%_bindir</code> macro	no	<code>/usr/bin/</code>
<code>%_root_sbindir</code>	Software Collection's <code>%_sbindir</code> macro	no	<code>/usr/sbin/</code>
<code>%_root_datadir</code>	Software Collection's <code>%_datadir</code> macro	no	<code>/usr/share/</code>
<code>%_root_sysconfdir</code>	Software Collection's <code>%_sysconfdir</code> macro	no	<code>/etc/</code>
<code>%_root_libexecdir</code>	Software Collection's <code>%_libexecdir</code> macro	no	<code>/usr/libexec/</code>
<code>%_root_sharedstatedir</code>	Software Collection's <code>%_sharedstatedir</code> macro	no	<code>/usr/com/</code>
<code>%_root_localstatedir</code>	Software Collection's <code>%_localstatedir</code> macro	no	<code>/usr/var/</code>
<code>%_root_includedir</code>	Software Collection's <code>%_includedir</code> macro	no	<code>/usr/include/</code>
<code>%_root_infodir</code>	Software Collection's <code>%_infodir</code> macro	no	<code>/usr/share/info/</code>
<code>%_root_mandir</code>	Software Collection's <code>%_mandir</code> macro	no	<code>/usr/share/man/</code>
<code>%_root_initddir</code>	Software Collection's <code>%_initddir</code> macro	no	<code>/etc/rc.d/init.d/</code>
<code>%_root_libdir</code>	Software Collection's <code>%_libdir</code> macro, this macro does not work if Software Collection's metapackage is platform-independent	no	<code>/usr/lib/</code>

2.9. Converting a Conventional Spec File

The following steps show how to convert a conventional spec file into a Software Collection spec file so that the Software Collection spec file can be used in both the conventional package and the Software Collection.

Procedure 2.1. Converting a conventional spec file into a Software Collection spec file

1. Add the `%scl_package` macro to the spec file. Place the macro in front of the spec file preamble as follows:

```
%{?scl:%scl_package package_name}
```

2. You are advised to define the `%pkg_name` macro in the spec file in case the package is not built for the Software Collection:

```
%{!?scl:%global pkg_name %{name}}
```

Consequently, you can use the `%pkg_name` macro to define the original name of the package wherever it is needed in the spec file that you can then use for building both the conventional package and the Software Collection.

3. Change the **Name** tag in the spec file preamble as follows:

```
Name: %{?scl_prefix}package_name
```

4. If you are building or linking with other Software Collection packages, then prefix the names of those Software Collection packages in the **Requires** and **BuildRequires** tags with `%{?scl_prefix}` as follows:

```
Requires: %{?scl_prefix}ifconfig
```

When depending on the system versions of packages, you should avoid using versioned **Requires** or **BuildRequires**. If you need to depend on a package that could be updated by the system, consider including that package in your Software Collection, or remember to rebuild your Software Collection when the system package updates.

5. To check that all essential Software Collection's packages are dependencies of the main metapackage, add the following macro after the **BuildRequires** or **Requires** tags in the spec file:

```
%{?scl:Requires: %scl_runtime}
```

6. Prefix the **Obsoletes**, **Conflicts** and **BuildConflicts** tags with `%{?scl_prefix}`. This is to ensure that the Software Collection can be used to deploy new packages to older systems without having the packages specified, for example, by **Obsolete** removed from the base system installation. For example:

```
Obsoletes: %{?scl_prefix}lesspipe < 1.0
```

7. Prefix the **Provides** tag with `%{?scl_prefix}`, as in the following example:

```
Provides: %{?scl_prefix}more
```

8. For any subpackages that define their name with the `-n` option, prefix their name with `%{?scl_prefix}`, as in the following example:

```
%package -n %{?scl_prefix}more
```

9. Add or edit the `%setup` macro in the `%prep` section of the spec file so that the macro can deal with a different package name in the Software Collection environment:

```
%setup -q -n %{pkg_name}-%{version}
```

Note that the **%setup** macro is required and that you must always use the macro with the **-n** option to successfully build your Software Collection.

Example of the Converted Spec File

To see what the diff file comparing a conventional spec file with a converted spec file looks like, see the following example:

```
--- a/less.spec
+++ b/less.spec
@@ -1,10 +1,13 @@
+{%?scl:%scl_package less}
+{%!%scl:%global pkg_name %{name}}
+
+Summary: A text file browser similar to more, but better
-Name: less
+Name: {%?scl_prefix}less
+Version: 444
+Release: 7{%?dist}
+License: GPLv3+
+Group: Applications/Text
-Source: http://www.greenwoodsoftware.com/less/%{name}-%{version}.tar.gz
+Source: http://www.greenwoodsoftware.com/less/%{pkg_name}-%{version}.tar.gz
+Source1: lesspipe.sh
+Source2: less.sh
+Source3: less.csh
@@ -19,6 +22,7 @@ URL: http://www.greenwoodsoftware.com/less/
+Requires: groff
+BuildRequires: ncurses-devel
+BuildRequires: autoconf automake libtool
-Obsoletes: lesspipe < 1.0
+Obsoletes: {%?scl_prefix}lesspipe < 1.0
+{%?scl:Requires: %scl_runtime}

%description
The less utility is a text file browser that resembles more, but has
@@ -31,7 +35,7 @@ You should install less because it is a basic utility for viewing text
files, and you'll use it frequently.

%prep
-%setup -q
+{%setup -q -n %{pkg_name}-%{version}}
+{%patch1 -p1 -b .Foption}
+{%patch2 -p1 -b .search}
+{%patch4 -p1 -b .time}
@@ -51,16 +55,16 @@ make CC="gcc $RPM_OPT_FLAGS -D_GNU_SOURCE -D_LARGEFILE_SOURCE -
D_LARGEFILE64_SOU
%install
rm -rf $RPM_BUILD_ROOT
make DESTDIR=$RPM_BUILD_ROOT install
-mkdir -p $RPM_BUILD_ROOT/etc/profile.d
+mkdir -p $RPM_BUILD_ROOT%{_sysconfdir}/profile.d
+install -p -c -m 755 %{SOURCE1} $RPM_BUILD_ROOT/%{_bindir}
+install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT/etc/profile.d
+install -p -c -m 644 %{SOURCE3} $RPM_BUILD_ROOT/etc/profile.d
+ls -la $RPM_BUILD_ROOT/etc/profile.d
+install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{_sysconfdir}/profile.d
+install -p -c -m 644 %{SOURCE3} $RPM_BUILD_ROOT%{_sysconfdir}/profile.d
+ls -la $RPM_BUILD_ROOT%{_sysconfdir}/profile.d

%files
%defattr(-,root,root,-)
%doc LICENSE
-/etc/profile.d/*
```

```
+%{_sysconfdir}/profile.d/*
%{_bindir}/*
%{_mandir}/man1/*
```

2.10. Uninstalling All Software Collection Directories

Keep in mind that the **yum remove** command does not uninstall directories provided by those Software Collection packages and subpackages that are removed after the Software Collection *runtime* subpackage is removed.

To ensure that all directories are uninstalled, make those packages and subpackages depend on the *runtime* subpackage. To do so, add the following line to the spec file of each of those packages and subpackages:

```
%{?scl:Requires: %{scl}-runtime}
```

Adding the above line ensures that all directories provided by those packages and subpackages are removed correctly as long as the *runtime* subpackage does not depend on any of those packages and subpackages.

2.11. Making a Software Collection Depend on Another Software Collection

To make one Software Collection depend on a package from another Software Collection, you need to adjust the **BuildRequires** and **Requires** tags in the dependent Software Collection's spec file so that these tags properly define the dependency.

For example, to define dependencies on two Software Collections named **software_collection_1** and **software_collection_2**, add the following three lines to your application's spec file:

```
BuildRequires: scl-utils-build
Requires: %scl_require software_collection_1
Requires: %scl_require software_collection_2
```

Ensure that the spec file also contains the **%scl_package** macro in front of the spec file preamble, for example:

```
%{?scl:%scl_package less}
```

Note that the **%scl_package** macro must be included in every spec file of your Software Collection.

You can also use the **%scl_require_package** macro to define dependencies on a particular package from a specific Software Collection, as in the following example:

```
BuildRequires: scl-utils-build
Requires: %scl_require_package software_collection_1 package_name
```

2.12. Building a Software Collection

To build a Software Collection on your system, run the following command:

```
rpmbuild -ba package.spec --define 'scl name'
```

The difference between the command shown above and the standard command to build conventional packages (**rpmbuild -ba *package.spec***) is that you have to append the **--define** option to the **rpmbuild** command when building a Software Collection.

The **--define** option defines the **scl** macro, which uses the Software Collection configured in the Software Collection spec file (***package.spec***).

Alternatively, to be able to use the standard command **rpmbuild -ba *package.spec*** to build the Software Collection, specify the following in the ***package.spec*** file:

```
BuildRequires: software_collection-build
```

where *software_collection* is the name of the Software Collection.

2.12.1. Rebuilding a Software Collection without build Subpackages

If you wish to rebuild a Software Collection that is distributed without build subpackages (*software_collection-build*) and you do not want or cannot use the **rpmbuild -ba *package.spec* --define 'scl *name*'** command to build the Software Collection, you can have the build subpackages created by rebuilding the Software Collection metapackage. Note that you need to have the *scl-utils-build* package installed on your system, otherwise rebuilding the Software Collection metapackage with the **rpmbuild** command will fail.

Advanced Topics

This chapter discusses advanced topics on packaging Software Collections.

3.1. Software Collection Automatic Provides and Requires and Filtering Support



Important

The functionality described in this section is not available in Enterprise Linux 5 and 6.

RPM in Fedora and Enterprise Linux 7 features support for automatic **Provides** and **Requires** and filtering. For example, for all Python libraries, RPM automatically adds the following **Requires**:

```
Requires: python(abi) = (version)
```

As explained in [Section 2.9, “Converting a Conventional Spec File”](#), you should prefix this **Requires** with `%{?scl_prefix}` when converting your conventional RPM package:

```
Requires: %{?scl_prefix}python(abi) = (version))
```

Keep in mind that the scripts searching for these dependencies must sometimes be rewritten for your Software Collection, as the original RPM scripts are not extensible enough, and, in some cases, filtering is not usable. For example, to rewrite automatic Python **Provides** and **Requires**, add the following lines in the `macros.%{scl}-config` macro file:

```
%__python_provides /usr/lib/rpm/pythondeps-scl.sh --provides %{_scl_root} %{scl_prefix}
%__python_requires /usr/lib/rpm/pythondeps-scl.sh --requires %{_scl_root} %{scl_prefix}
```

The `/usr/lib/rpm/pythondeps-scl.sh` file is based on a `pythondeps.sh` file from the conventional package and adjusts search paths.

If there are **Provides** or **Requires** that you need to adjust, for example, a `pkg_config Provides`, there are two ways to do it:

- Add the following lines in the `macros.%{scl}-config` macro file so that it applies to all packages in the Software Collection:

```
%_use_internal_dependency_generator 0
%__deploop() while read FILE; do /usr/lib/rpm/rpmddeps -%{1} ${FILE}; done | /bin/sort -u
%__find_provides /bin/sh -c "%{?__filter_prov_cmd} %{__deploop P} %{?__filter_from_prov}"
%__find_requires /bin/sh -c "%{?__filter_req_cmd} %{__deploop R} %{?__filter_from_req}"

# Handle pkgconfig's virtual Provides and Requires
%__filter_from_req | %{__sed} -e 's|pkgconfig|%{?scl_prefix}pkgconfig|g'
%__filter_from_prov | %{__sed} -e 's|pkgconfig|%{?scl_prefix}pkgconfig|g'
```

- Or, alternatively, add the following lines after tag definitions in every spec file for which you want to filter **Provides** or **Requires**:

```
%{?scl:filter_from_provides s|pkgconfig|%{?scl_prefix}pkgconfig|g}
%{?scl:filter_from_requires s|pkgconfig|%{?scl_prefix}pkgconfig|g}
%{?scl:filter_setup}
```



Important

When using filters, you need to pay attention to the automatic dependencies you change. For example, if the conventional package contains **Requires: pkgconfig(package_1)** and **Requires: pkgconfig(package_2)**, and only *package_2* is included in the Software Collection, ensure that you do not filter the **Requires** tag for *package_1*.

3.2. Software Collection Macro Files Support

In some cases, you may need to ship macro files with your Software Collection packages. They are located in the `%{?scl:%{_root_sysconffdir}}%{!?scl:%{_sysconffdir}}/rpm/` directory, which corresponds to the `/etc/rpm/` directory for conventional packages. When shipping macro files, ensure that:

- You rename the macro files by appending `.%{scl}` to their names so that they do not conflict with the files from the base system installation.
- The macros in the macro files are either not expanded, or they are using conditionals, as in the following example:

```
%__python2 %{_bindir}/python
%python2_sitelib %(%{?scl:scl enable %scl '}%{__python2} -c "from distutils.sysconfig
import get_python_lib; print(get_python_lib())"%{?scl:'})
```

As another example, there may be a situation where you need to create a Software Collection *mypython* that depends on a Software Collection *python26*. The *python26* Software Collection defines the `%{__python2}` macro as in the above sample. This macro will evaluate to `/opt/provider/mypython/root/usr/bin/python2`, but the `python2` binary is only available in the *python26* Software Collection (`/opt/provider/python26/root/usr/bin/python2`).

To be able to build software in the *mypython* Software Collection environment, ensure that:

- The `macros.python.python26` macro file, which is a part of the *python26-python-devel* package, contains the following line:

```
%__python26_python2 /opt/provider/python26/root/usr/bin/python2
```

- And the macro file in the *python26-build* subpackage, and also the *build* subpackage in any depending Software Collection, contains the following line:

```
%scl_package_override() {%global __python2 %__python26_python2}
```

This will redefine the `%{__python2}` macro only if the build subpackage from a corresponding Software Collection is present, which usually means that you want to build software for that Software Collection.

3.3. Packaging Wrappers for Software Collections

Using wrappers is an easy way to shorten commands that the user runs in the Software Collection environment.

The following is an example of a wrapper from a Ruby-based Software Collection named *rubyscl* that is installed as `/usr/bin/rubyscl-ruby` and allows the user to run **rubyscl-ruby command** instead of **scl enable rubyscl 'ruby command'**:

```
#!/bin/bash

COMMAND="ruby $@"
scl enable rubyscl "$COMMAND"
```

It is important to package these wrappers as subpackages of the Software Collection package that will use them. That way, you can make installation of these wrappers optional, allowing the user not to install them, for example, on systems with read-only access to the `/usr/bin/` directory where the wrappers would otherwise be installed.

3.4. Software Collection Initscript Support

Ensure that users can directly manage any services provided by the Software Collection or one of the associated applications with the system default tools, like **service** or **chkconfig**.

To avoid possible name conflicts with the system versions of the services that are part of the Software Collection, make sure to adjust the **%install** section of the spec file as follows:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT{%?scl:%_root_sysconfdir%{!scl:
%_sysconfdir}/rc.d/init.d/%{?scl_prefix}service_name
```

With this configuration in place, you can then refer to the version of the service included in the Software Collection as follows:

```
%{?scl_prefix}service_name
```

3.5. Software Collection Library Support

In case you distribute libraries that you intend to use only in the Software Collection environment or in addition to the libraries available on the system, update the `LD_LIBRARY_PATH` environment variable in the **enable** scriptlet as follows:

```
export LD_LIBRARY_PATH=%{_libdir}${LD_LIBRARY_PATH:+:${LD_LIBRARY_PATH}}
```

The configuration ensures that the version of the library in the Software Collection is preferred over the version of the library available on the system if the Software Collection is enabled.

 Note

In case you distribute a private shared library in the Software Collection, consider using the `DT_RUNPATH` attribute instead of the `LD_LIBRARY_PATH` environment variable to make the private shared library accessible in the Software Collection environment.

3.5.1. Using a Library Outside of the Software Collection

If you distribute libraries that you intend to use outside of the Software Collection environment, you can use the directory `/etc/ld.so.conf.d/` for this purpose.



Warning

Do not use `/etc/ld.so.conf.d/` for libraries already available on the system. Using `/etc/ld.so.conf.d/` is only recommended for a library that is not available on the system, as otherwise the version of the library in the Software Collection might get preference over the system version of the library. That could lead to undesired behavior of the system versions of the applications, including unexpected termination and data loss.

Procedure 3.1. Using `/etc/ld.so.conf.d/` for libraries in the Software Collection

1. Create a file named `%{?scl_prefix}libs.conf` and adjust the spec file configuration accordingly:

```
SOURCE2: %{?scl_prefix}libs.conf
```

2. In the `%{?scl_prefix}libs.conf` file, include a list of directories where the versions of the libraries associated with the Software Collection are located. For example:

```
/opt/provider/software_collection_1/root/usr/lib64/
```

In the example above, the `/usr/lib64/` directory that is part of the Software Collection `software_collection_1` is included in the list.

3. Edit the `%install` section of the spec file, so the `%{?scl_prefix}libs.conf` file is installed as follows:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!scl:
%_sysconfdir}/ld.so.conf.d/
```

3.5.2. Prefixing the Library Major soname with the Software Collection Name

When using libraries included in the Software Collection, always remember that a library with the same major soname can already be available on the system as a part of the base system installation. It is thus important not to forget to use the `scl enable` command when building an application

against a library included in the Software Collection. Failing to do so may result in the application being executed in an incorrect environment, linked against the incorrect system version of the library.



Warning

Keep in mind that executing your application in an incorrect environment (for example in the system environment instead of the Software Collection environment) as well as linking your application against an incorrect library can lead to undesired behavior of your application, including unexpected termination and data loss.

To ensure that your application is not linked against an incorrect library even if the `LD_LIBRARY_PATH` environment variable has not been set properly, change the major soname of the library included in the Software Collection. The recommended way to change the major soname is to prefix the major soname version number with the Software Collection name.

Below is an example of the MySQL client library with the **mysql155-** prefix:

```
$ rpm -ql mysql155-mysql-libs | grep 'lib.*so'
/opt/provider/mysql155/root/usr/lib64/mysql/libmysqlclient.so.mysql155-18
/opt/provider/mysql155/root/usr/lib64/mysql/libmysqlclient.so.mysql155-18.0.0
```

On the same system, the system version of the MySQL client library is listed below:

```
$ rpm -ql mysql-libs | grep 'lib.*so'
/usr/lib64/mysql/libmysqlclient.so.18
/usr/lib64/mysql/libmysqlclient.so.18.0.0
```

The **rpmbuild** utility generates an automatic **Provides** tag for packages that include a versioned shared library. If you do not prefix the soname as described above, then an example of the **Provides** in case of the *mysql* package is **libmysqlclient.so.18()(64bit)**. With this **Provides**, RPM can choose the incorrect RPM package, resulting in the application missing the requirement.

If you prefix the soname as described above, then an example of the generated **Provides** in case of *mysql* is **libmysqlclient.so.mysql155-18()(64bit)**. With this **Provides**, RPM chooses the correct RPM dependencies and the application's requirements are satisfied.

In general, unless absolutely necessary, Software Collection packages should not provide any symbols that are already provided by packages from the base system installation. One exception to that rule is when you want to use the symbols in the packages from the base system installation.

3.5.3. Software Collection Library Support in Fedora and Enterprise Linux 7

When building your Software Collection for Fedora or Enterprise Linux 7, use the `%__provides_exclude_from` macro to prevent scanning certain files for automatically generated RPM symbols.

For example, to prevent scanning **.so** files in the `%{_libdir}` directory, add the following lines before the **BuildRequires** or **Requires** tags in your Software Collection spec file:

```
%if %{?scl:1}%{!?:scl:0}
# Do not scan .so files in %{_libdir}
```

```
%global __provides_exclude_from ^%{_libdir}/.*.so.*$
%endif
```

The functionality is part of RPM support for automatic **Provides** and **Requires**, see [Section 3.1](#), “*Software Collection Automatic Provides and Requires and Filtering Support*” for more information.

3.6. Software Collection .pc Files Support

The .pc files are special metadata files used by the **pkg-config** program to store information about libraries available on the system.

In case you distribute .pc files that you intend to use only in the Software Collection environment or in addition to the .pc files installed on the system, update the `PKG_CONFIG_PATH` environment variable. Depending on what is defined in your .pc files, update the `PKG_CONFIG_PATH` environment variable for the `%{_libdir}` macro (which expands to the library directory, typically `/usr/lib/` or `/usr/lib64/`), or for the `%{_datadir}` macro (which expands to the share directory, typically `/usr/share/`).

If the library directory is defined in your .pc files, update the `PKG_CONFIG_PATH` environment variable by adjusting the `%install` section of the Software Collection spec file as follows:

```
%install
cat >> %{buildroot}%{_scl_scripts}/enable << EOF
export PKG_CONFIG_PATH=%{_libdir}/pkgconfig:\$PKG_CONFIG_PATH
EOF
```

If the share directory is defined in your .pc files, update the `PKG_CONFIG_PATH` environment variable by adjusting the `%install` section of the Software Collection spec file as follows:

```
%install
cat >> %{buildroot}%{_scl_scripts}/enable << EOF
export PKG_CONFIG_PATH=%{_datadir}/pkgconfig:\$PKG_CONFIG_PATH
EOF
```

The two examples above both configure the **enable** scriptlet so that it ensures that the .pc files in the Software Collection are preferred over the .pc files available on the system if the Software Collection is enabled.

The Software Collection can provide a wrapper script that is visible to the system to enable the Software Collection, for example in the `/usr/bin/` directory. In this case, ensure that the .pc files are visible to the system even if the Software Collection is disabled.

To allow your system to use .pc files from the disabled Software Collection, update the `PKG_CONFIG_PATH` environment variable with the paths to the .pc files associated with the Software Collection. Depending on what is defined in your .pc files, update the `PKG_CONFIG_PATH` environment variable for the `%{_libdir}` macro (which expands to the library directory), or for the `%{_datadir}` macro (which expands to the share directory).

Procedure 3.2. Updating the `PKG_CONFIG_PATH` environment variable for `%{_libdir}`

1. To update the `PKG_CONFIG_PATH` environment variable for the `%{_libdir}` macro, create a custom script `/etc/profile.d/name.sh`. The script is preloaded when a shell is started on the system.

For example, create the following file:

```
%{?scl_prefix}pc-libdir.sh
```

2. Use the **pc-libdir.sh** short script that modifies the `PKG_CONFIG_PATH` variable to refer to your `.pc` files:

```
export PKG_CONFIG_PATH=%{_libdir}/pkgconfig:/opt/provider/software_collection/path/to/your/pc_files
```

3. Add the file to your Software Collection package's spec file:

```
SOURCE2: %{?scl_prefix}pc-libdir.sh
```

4. Install this file into the system `/etc/profile.d/` directory by adjusting the `%install` section of the Software Collection package's spec file:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!?scl:%_sysconfdir}/profile.d/
```

Procedure 3.3. Updating the `PKG_CONFIG_PATH` environment variable for `%{_datadir}`

1. To update the `PKG_CONFIG_PATH` environment variable for the `%{_datadir}` macro, create a custom script `/etc/profile.d/name.sh`. The script is preloaded when a shell is started on the system.

For example, create the following file:

```
%{?scl_prefix}pc-datadir.sh
```

2. Use the **pc-datadir.sh** short script that modifies the `PKG_CONFIG_PATH` variable to refer to your `.pc` files:

```
export PKG_CONFIG_PATH=%{_datadir}/pkgconfig:/opt/provider/software_collection/path/to/your/pc_files
```

3. Add the file to your Software Collection package's spec file:

```
SOURCE2: %{?scl_prefix}pc-datadir.sh
```

4. Install this file into the system `/etc/profile.d/` directory by adjusting the `%install` section of the Software Collection package's spec file:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!?scl:%_sysconfdir}/profile.d/
```

3.7. Software Collection MANPATH Support

To allow the `man` command on the system to display manual pages from the enabled Software Collection, update the `MANPATH` environment variable with the paths to the manual pages that are associated with the Software Collection.

To update the `MANPATH` environment variable, add the following to the `%install` section of the Software Collection spec file:

```
%install
cat >> %{buildroot}%{_scl_scripts}/enable << EOF
export MANPATH=%{_mandir}:\${MANPATH}
EOF
```

This configures the **enable** scriptlet to update the MANPATH environment variable. The manual pages associated with the Software Collection are then not visible as long as the Software Collection is not enabled.

The Software Collection can provide a wrapper script that is visible to the system to enable the Software Collection, for example in the **/usr/bin/** directory. In this case, ensure that the manual pages are visible to the system even if the Software Collection is disabled.

To allow the **man** command on the system to display manual pages from the disabled Software Collection, update the MANPATH environment variable with the paths to the manual pages associated with the Software Collection.

Procedure 3.4. Updating the MANPATH environment variable for the disabled Software Collection

1. To update the MANPATH environment variable, create a custom script **/etc/profile.d/name.sh**. The script is preloaded when a shell is started on the system.

For example, create the following file:

```
%{?scl_prefix}manpage.sh
```

2. Use the **manpage.sh** short script that modifies the MANPATH variable to refer to your man path directory:

```
export MANPATH=/opt/provider/software_collection/path/to/your/man_pages:${MANPATH}
```

3. Add the file to your Software Collection package's spec file:

```
SOURCE2: %{?scl_prefix}manpage.sh
```

4. Install this file into the system **/etc/profile.d/** directory by adjusting the **%install** section of the Software Collection package's spec file:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!scl:
%_sysconfdir}/profile.d/
```

3.8. Software Collection cronjob Support

With your Software Collection, you can run periodic tasks on the system either with a dedicated service or with cronjobs. If you intend to use a dedicated service, refer to [Section 3.4, “Software Collection Initscript Support”](#) on how to work with initscripts in the Software Collection environment.

Procedure 3.5. Running periodic tasks with cronjobs

1. To use cronjobs for running periodic tasks, place a **crontab** file for your Software Collection in the **/etc/cron.d/** directory with the Software Collection's name.

For example, create the following file:

```
%{?scl_prefix}crontab
```

2. Ensure that the contents of the **crontab** file follow the standard **crontab** file format, as in the following example:

```
0 1 * * Sun root scl enable software_collection '/opt/provider/software_collection/root/
usr/bin/cron_job_name'
```

where *software_collection* is the name of your Software Collection, and /
opt/provider/software_collection/root/usr/bin/cron_job_name is the command
you want to periodically run.

3. Add the file to your spec file of the Software Collection package:

```
SOURCE2: %{?scl_prefix}crontab
```

4. Install the file into the system directory **/etc/cron.d/** by adjusting the **%install** section of the Software Collection package's spec file:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!?scl:
%_sysconfdir}/cron.d/
```

3.9. Software Collection Log File Support

By default, programs packaged in a Software Collection create log files in the /
opt/provider/software_collection/root/var/log/ directory. Consider creating the
log files outside of the Software Collection file system hierarchy, that is in the **/var/log/** system
directory. When using the system directory, all log files are stored in the same location, which makes it
easier for users to locate and manage them.

3.10. Software Collection logrotate Support

With your Software Collection or an application associated with your Software Collection, you can
manage log files with the **logrotate** program.

Procedure 3.6. Managing log files with logrotate

1. To manage your log files with **logrotate**, place a custom **logrotate** file for your Software Collection in the system directory for the **logrotate** jobs **/etc/logrotate.d/**.

For example, create the following file:

```
%{?scl_prefix}logrotate
```

2. Ensure that the contents of the **logrotate** file follow the standard **logrotate** file format as follows:

```
/opt/provider/software_collection/var/log/your_application_name.log {
    missingok
    notifempty
    size 30k
    yearly
```

```
create 0600 root root
}
```

3. Add the file to your spec file of the Software Collection package:

```
SOURCE2: %{?scl_prefix}logrotate
```

4. Install the file into the system directory **/etc/logrotate.d/** by adjusting the **%install** section of the Software Collection package's spec file:

```
%install
install -p -c -m 644 %{SOURCE2} $RPM_BUILD_ROOT%{?scl:%_root_sysconfdir}%{!?scl:
%_sysconfdir}/logrotate.d/
```

3.11. Software Collection Lock File Support

If you store your Software Collection's lock files within the **/opt/provider/software_collection/** file system hierarchy, you can avoid any possible conflicts with the system versions of the applications or services that can be on the system.

If you want to prevent Software Collection's applications or services from running while the system version of the respective application or service is running, make sure that your applications or services, which require a lock, write the lock to the system directory **/var/lock/** instead of the Software Collection's directory **/opt/provider/software_collection/var/lock/**. In this way, your applications or services' lock file will not be overwritten. The lock file will not be renamed and the name stays the same as the system version.

If you want your Software Collection's version of the application or service to run concurrently with the system version (when the Software Collection version's resources will not conflict with the system version's resources), ensure that the applications or services write the lock to the Software Collection's directory **/opt/provider/software_collection/var/lock/**.

3.12. Software Collection Configuration Files Support

If you store your Software Collection's configuration files within the **/opt/provider/software_collection/** file system hierarchy, you can avoid any possible conflicts with the system versions of the configuration files that can be present on the system.

If you cannot store the configuration files within **/opt/provider/software_collection/**, then ensure that you properly configure an alternative location for the configuration files. For many programs, this can be usually done at build or installation time.

3.13. Software Collection Kernel Module Support

Because Linux kernel modules are normally tied to a particular version of the Linux kernel, you must be careful when you package kernel modules into a Software Collection. This is because the package management system on Fedora and Enterprise Linux does not automatically update or install an updated version of the kernel module if an updated version of the Linux kernel is installed. To make packaging the kernel modules into the Software Collection easier, see the following recommendations. Ensure that:

1. the name of your kernel module package includes the kernel version,
2. the tag **Requires**, which can be found in your kernel module spec file, includes the kernel version and revision (in the format **kernel-version-revision**).

3.14. Software Collection SELinux Support

Because Software Collections are designed to install the Software Collection packages in an alternate directory, set up the necessary SELinux labels so that SELinux is aware of the alternate directory.

If the file system hierarchy of your Software Collection package imitates the file system hierarchy of the corresponding conventional package, you can run the **semanage fcontext** and **restorecon** commands to set up the SELinux labels.

For example, if the **/opt/provider/software_collection_1/root/usr/** directory in your Software Collection package imitates the **/usr/** directory of your conventional package, set up the SELinux labels as follows:

```
semanage fcontext -a -e /usr /opt/provider/software_collection_1/root/usr
```

```
restorecon -R -v /opt/provider/software_collection_1/root/usr
```

The commands above ensure that all directories and files in the **/opt/provider/software_collection_1/root/usr/** directory are labeled by SELinux as if they were located in the **/usr/** directory.

3.14.1. SELinux Support in Fedora and Enterprise Linux 7

When packaging a Software Collection for Fedora or Enterprise Linux 7, add the following commands to the **%post** section in the Software Collection metapackage to set up the SELinux labels:

```
semanage fcontext -a -e /usr /opt/provider/software_collection_1/root/usr
```

```
restorecon -R -v /opt/provider/software_collection_1/root/usr
```

```
selinuxenabled && load_policy || :
```

The last command ensures that the newly created SELinux policy is properly loaded, and that the files installed by a package in the Software Collection are created with the correct SELinux context. By using this command in the metapackage, you do not need to include the **restorecon** command in all packages in the Software Collection.

Note that the **semanage fcontext** command is provided by the *policycoreutils-python* package, therefore it is important that you include **policycoreutils-python** in **Requires** for the Software Collection metapackage.

3.14.2. SELinux Support in Enterprise Linux 5

Keep in mind that the **semanage -e** command, which substitutes the source path for the destination path during labeling, is not supported in Enterprise Linux 5.

Extending Software Collections

This chapter describes extending Software Collections.

4.1. Providing an *scldevel* Subpackage

Providing an *scldevel* subpackage in your Software Collection's metapackage can make it easier for users to create a dependent Software Collection. This section describes creating an *scldevel* subpackage for Ruby-based Software Collections, *ruby193* and *ruby200*.

Procedure 4.1. Providing your own *scldevel* subpackage

1. In your Software Collection's metapackage, add the *scldevel* subpackage by defining its name, summary, and description:

```
%package scldevel
Summary: Package shipping development files for %scl
Provides: scldevel(%{scl_name_base})

%description scldevel
Package shipping development files, especially useful for development of
packages depending on %scl Software Collection.
```

You are advised to use the virtual **Provides: *scldevel(%{scl_name_base})*** during the build of packages of dependent Software Collections. This will ensure availability of a version of the *%{scl_name_base}* Software Collection and its macros, as specified in the following step.

2. In the **%install** section of your Software Collection's metapackage, create the **macros.*%{scl_name_base}-scldevel*** file that is part of the *scldevel* subpackage and contains:

```
cat >> %{buildroot}%{_root_sysconfdir}/rpm/macros.%{scl_name_base}-scldevel << EOF
%%scl_%{scl_name_base} %{scl}
%%scl_prefix_%{scl_name_base} %{scl_prefix}
EOF
```

Note that between all Software Collections that share the same *%{scl_name_base}* name, the provided **macros.*%{scl_name_base}-scldevel*** files must conflict. This is to disallow installing multiple versions of the *%{scl_name_base}* Software Collections. For example, in Red Hat Software Collections, the *ruby193-scldevel* subpackage cannot be installed when there is the *ruby200-scldevel* subpackage installed.

4.1.1. Using an *scldevel* Subpackage in a Dependent Software Collection

To use your *scldevel* subpackage in a Software Collection that depends on a Software Collection *ruby200*, update the metapackage of the dependent Software Collection as described below.

Procedure 4.2. Using your own *scldevel* subpackage in a dependent Software Collection

1. Consider adding the following at the beginning of the metapackage's spec file:

```
%{!?scl_ruby:%global scl_ruby ruby200}
%{!?scl_prefix_ruby:%global scl_prefix_ruby %{scl_ruby}-}
```

These two lines are optional. They are only meant as a visual hint that the dependent Software Collection has been designed to depend on the *ruby200* Software Collection. If there is no other

`scldevel` subpackage available in the build root, then the `ruby200-scldevel` subpackage is used as a build requirement.

You can substitute these lines with the following line:

```
%{?scl_prefix_ruby}
```

2. Add the following build requirement to the metapackage:

```
BuildRequires: %{scl_prefix_ruby}scldevel
```

By specifying this build requirement, you ensure that the `scldevel` subpackage is in the build root and that the default values are not in use. Omitting this package could result in broken requires at the subsequent packages' build time.

3. Ensure that the **%package runtime** part of the metapackage's spec file includes the following lines:

```
%package runtime
Summary: Package that handles %scl Software Collection.
Requires: scl-utils
Requires: %{scl_prefix_ruby}runtime
```

4. Ensure that the **%package build** part of the metapackage's spec file includes the following lines:

```
%package build
Summary: Package shipping basic build configuration
Requires: %{scl_prefix_ruby}scldevel
```

Specifying **Requires: %{scl_prefix_ruby}scldevel** ensures that macros are available in all packages of the Software Collection.

Troubleshooting Software Collections

This chapter helps you troubleshoot some of the common issues you can encounter when building your Software Collections.

5.1. Error: line XX: Unknown tag: %scl_package *software_collection_name*

You can encounter this error message when building a Software Collection package. It is usually caused by a missing package *scl-utils-build*. To install the *scl-utils-build* package, run the following command:

```
# yum install scl-utils-build
```

For more information, see [Section 1.3, “Enabling Support for Software Collections”](#).

5.2. scl command does not exist

This error message is usually caused by a missing package *scl-utils*. To install the *scl-utils* package, run the following command:

```
# yum install scl-utils
```

For more information, see [Section 1.3, “Enabling Support for Software Collections”](#).

5.3. Unable to open /etc/scl/ *prefixes/software_collection_name*

This error message can be caused by using incorrect arguments with the **scl** command you are calling. Check the **scl** command is correct and that you have not mistyped any of the arguments.

The same error message can also be caused by a missing Software Collection. Ensure that the *software_collection_name* Software Collection is properly installed on the system. For more information, see [Section 1.5, “Listing Installed Software Collections”](#).

5.4. scl_source: command not found

This error message is usually caused by having an old version of the *scl-utils* package installed. To update the *scl-utils* package, run the following command:

```
# yum update scl-utils
```


Getting More Information

For more information on Software Collection packaging and Fedora, refer to the resources listed below.

6.1. Installed Documentation

- **scl(1)** – The manual page for the **scl** tool for enabling Software Collections and running programs in Software Collection's environment.
- **scl --help** – General usage information for the **scl** tool for enabling Software Collections and running programs in Software Collection's environment.
- **rpmbuild(8)** – The manual page for the **rpmbuild** utility for building both binary and source packages.

6.2. Accessing Online Resources

The following is a brief list of resources that are directly or indirectly relevant to this book:

- [SoftwareCollections.org](https://www.softwarecollections.org/)¹ – The *SoftwareCollections.org* website is the home for projects creating Software Collections (SCLs) for Red Hat Enterprise Linux, Fedora, CentOS, and Scientific Linux. This is where you create and host SCLs, as well as connect with other developers working on Software Collections. SoftwareCollections.org is also the central repository for users to find third-party Software Collections for their systems.
- [spec2scl](https://bitbucket.org/bkabrda/spec2scl/)² – The **spec2scl** tool can help you convert conventional RPM spec files to SCL-style spec files. Install it on Fedora by running the **yum install spec2scl** command.
- [Fedora 20 Installation Guide](http://docs.fedoraproject.org/en-US/Fedora/20/html/Installation_Guide/index.html)³ – The *Installation Guide* for Fedora 20 provides more details on getting, installing, and updating the system.
- [Fedora 18 System Administrator's Guide](http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html)⁴ – The *System Administrator's Guide* for Fedora 18 documents relevant information regarding the deployment, configuration, and administration of Fedora.

¹ <https://www.softwarecollections.org/>

² <https://bitbucket.org/bkabrda/spec2scl/>

³ http://docs.fedoraproject.org/en-US/Fedora/20/html/Installation_Guide/index.html

⁴ http://docs.fedoraproject.org/en-US/Fedora/18/html/System_Administrators_Guide/index.html

Appendix A. Revision History

Revision 1-5 Mon 08 Jun 2015

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The Software Collections Guide is now deprecated.
Add a deprecation note.

Revision 1-4 Fri Jul 11 2014

Petr Kovář pkovar@redhat.com

1-4 release of the Software Collections Guide.

Revision 1-3 Sun Mar 23 2014

Petr Kovář pkovar@redhat.com

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Petr Kovář pkovar@redhat.com

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Petr Kovář pkovar@redhat.com

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Petr Kovář pkovar@redhat.com

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