



# Red Hat Developer Tools 1

## Using Rust 1.66.1 Toolset

Installing and using Rust 1.66.1 Toolset



# Red Hat Developer Tools 1 Using Rust 1.66.1 Toolset

---

Installing and using Rust 1.66.1 Toolset

Jacob Valdez

jvaldez@redhat.com

## Legal Notice

Copyright © 2023 Red Hat, Inc.

The text of and illustrations in this document are licensed by Red Hat under a Creative Commons Attribution–Share Alike 3.0 Unported license ("CC-BY-SA"). An explanation of CC-BY-SA is available at

<http://creativecommons.org/licenses/by-sa/3.0/>

. In accordance with CC-BY-SA, if you distribute this document or an adaptation of it, you must provide the URL for the original version.

Red Hat, as the licensor of this document, waives the right to enforce, and agrees not to assert, Section 4d of CC-BY-SA to the fullest extent permitted by applicable law.

Red Hat, Red Hat Enterprise Linux, the Shadowman logo, the Red Hat logo, JBoss, OpenShift, Fedora, the Infinity logo, and RHCE are trademarks of Red Hat, Inc., registered in the United States and other countries.

Linux<sup>®</sup> is the registered trademark of Linus Torvalds in the United States and other countries.

Java<sup>®</sup> is a registered trademark of Oracle and/or its affiliates.

XFS<sup>®</sup> is a trademark of Silicon Graphics International Corp. or its subsidiaries in the United States and/or other countries.

MySQL<sup>®</sup> is a registered trademark of MySQL AB in the United States, the European Union and other countries.

Node.js<sup>®</sup> is an official trademark of Joyent. Red Hat is not formally related to or endorsed by the official Joyent Node.js open source or commercial project.

The OpenStack<sup>®</sup> Word Mark and OpenStack logo are either registered trademarks/service marks or trademarks/service marks of the OpenStack Foundation, in the United States and other countries and are used with the OpenStack Foundation's permission. We are not affiliated with, endorsed or sponsored by the OpenStack Foundation, or the OpenStack community.

All other trademarks are the property of their respective owners.

## Abstract

Rust Toolset is a Red Hat offering for developers on the Red Hat Enterprise Linux (RHEL) operating system. Use this guide for an overview of Rust Toolset, to learn how to invoke and use different versions of Rust tools, and to find resources with more in-depth information.

---

## Table of Contents

<b>MAKING OPEN SOURCE MORE INCLUSIVE</b> .....	<b>3</b>
<b>CHAPTER 1. RUST TOOLSET</b> .....	<b>4</b>
1.1. RUST TOOLSET COMPONENTS	4
1.2. RUST TOOLSET COMPATIBILITY	4
1.3. GETTING ACCESS TO RUST TOOLSET ON RED HAT ENTERPRISE LINUX 7	4
1.4. INSTALLING RUST TOOLSET	6
1.5. INSTALLING RUST DOCUMENTATION	6
1.6. INSTALLING CARGO DOCUMENTATION	7
1.7. ADDITIONAL RESOURCES	8
<b>CHAPTER 2. THE CARGO BUILD TOOL</b> .....	<b>9</b>
2.1. THE CARGO DIRECTORY STRUCTURE AND FILE PLACEMENTS	9
2.2. CREATING A RUST PROJECT	9
2.3. CREATING A RUST LIBRARY PROJECT	10
2.4. BUILDING A RUST PROJECT	10
2.5. BUILDING A RUST PROJECT IN RELEASE MODE	11
2.6. RUNNING A RUST PROGRAM	12
2.7. TESTING A RUST PROJECT	12
2.8. TESTING A RUST PROJECT IN RELEASE MODE	13
2.9. CONFIGURING RUST PROJECT DEPENDENCIES	14
2.10. BUILDING DOCUMENTATION FOR A RUST PROJECT	15
2.11. COMPILING CODE INTO A WEBASSEMBLY BINARY WITH RUST ON RED HAT ENTERPRISE LINUX 8 AND RED HAT ENTERPRISE LINUX 9 BETA	16
2.12. VENDORING RUST PROJECT DEPENDENCIES	16
2.13. ADDITIONAL RESOURCES	17
<b>CHAPTER 3. THE RUSTFMT FORMATTING TOOL</b> .....	<b>18</b>
3.1. INSTALLING RUSTFMT	18
3.2. USING RUSTFMT AS A STANDALONE TOOL	18
3.3. USING RUSTFMT WITH THE CARGO BUILD TOOL	19
3.4. ADDITIONAL RESOURCES	19
<b>CHAPTER 4. CONTAINER IMAGES WITH RUST TOOLSET ON RHEL 8</b> .....	<b>21</b>
4.1. CREATING A CONTAINER IMAGE OF RUST TOOLSET ON RHEL 8	21
4.2. ADDITIONAL RESOURCES	21
<b>CHAPTER 5. CHANGES IN RUST 1.66.1 TOOLSET</b> .....	<b>22</b>



## MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see [our CTO Chris Wright's message](#).

## CHAPTER 1. RUST TOOLSET

Rust Toolset is a Red Hat offering for developers on Red Hat Enterprise Linux (RHEL). It provides the **rustc** compiler for the Rust programming language, the Rust package manager Cargo, the **rustfmt** formatting tool, and required libraries.

Rust Toolset is distributed as a part of Red Hat Developer Tools for Red Hat Enterprise Linux 7. For Red Hat Enterprise Linux 8, Rust Toolset is available as a module. Rust Toolset is available as packages for Red Hat Enterprise Linux 9.

### 1.1. RUST TOOLSET COMPONENTS

The following components are available as part of Rust Toolset:

Name	Version	Description
<b>rust</b>	1.66.1	The Rust compiler front-end for LLVM.
<b>cargo</b>	1.66.1	A build system and dependency manager for Rust.
<b>rustfmt</b>	1.66.1	A tool for automatic formatting of Rust code.

### 1.2. RUST TOOLSET COMPATIBILITY

Rust Toolset is available for Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 8 and Red Hat Enterprise Linux 9 on the following architectures:

- AMD and Intel 64-bit
- 64-bit ARM (RHEL 8 and RHEL 9)
- IBM Power Systems, Little Endian
- IBM Power Systems, Big Endian (Only RHEL 7)
- 64-bit IBM Z

### 1.3. GETTING ACCESS TO RUST TOOLSET ON RED HAT ENTERPRISE LINUX 7

To be able to install Rust Toolset on Red Hat Enterprise Linux 7, you must access and enable Red Hat Developer Tools and Red Hat Software Collections repositories.

If these repositories are already attached to your system, see [Installing Rust Toolset](#).

#### Procedure

1. Install **Wget** by running:



```
# yum install wget
```

- Download the latest subscription data by running:

```
# subscription-manager refresh
```

- Register your system by running:

```
# subscription-manager register
```

To register your system using a graphical user interface (GUI), follow the [Registering and Unregistering a System](#) guide.

- Display a list of all available subscriptions and identify the pool ID by running:

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

- Find the pool ID on the line beginning with **Pool ID**.

- Attach the subscription that provides access to the **Red Hat Developer Tools** repository to your system by running:

```
# subscription-manager attach --pool=<pool ID from the subscription>
```

- Replace **<pool ID from the subscription>** with the pool ID you identified in the previous step.

- Verify which subscriptions are attached to your system by running:

```
# sudo subscription-manager list --consumed
```

- Enable the **rhel-7-variant-devtools-rpms** repository by running:

```
# subscription-manager repos --enable rhel-7-<variant>-devtools-rpms
```

- Replace **<variant>** with your Red Hat Enterprise Linux system variant: **server** or **workstation**.  
Use **server** to access the widest range of development tools.

- Enable the **rhel-variant-rhsc1-7-rpms** repository by running:

```
# subscription-manager repos --enable rhel-<variant>-rhsc1-7-rpms
```

- Replace **<variant>** with your Red Hat Enterprise Linux system variant: **server** or **workstation**.

- Add the Red Hat Developer Tools GPG key to your system by running:

```
# cd /etc/pki/rpm-gpg
# wget -O RPM-GPG-KEY-redhat-devel https://www.redhat.com/security/data/a5787476.txt
# rpm --import RPM-GPG-KEY-redhat-devel
```

## Additional resources

- For more information on registering your system and associating it with subscriptions, see the [Red Hat Subscription Management](#) guides collection.

## 1.4. INSTALLING RUST TOOLSET

Complete the following steps to install Rust Toolset including all development and debugging tools as well as dependent packages. Note that Rust Toolset has a dependency on LLVM Toolset.

### Prerequisites

- On Red Hat Enterprise Linux 7, a subscription providing access to the Red Hat Developer Tools content set is attached to your system.  
To attach the subscription, see [Getting access to Rust Toolset on Red Hat Enterprise Linux 7](#).
- All available Red Hat Enterprise Linux updates are installed.

### Procedure

On Red Hat Enterprise Linux 7, install the **rust-toolset-1.66** collection by running:

```
# yum install rust-toolset-1.66
```

On Red Hat Enterprise Linux 8, install the **rust-toolset** module by running:

```
# yum module install rust-toolset
```

On Red Hat Enterprise Linux 9, install the **rust-toolset** package by running:

```
# dnf install rust-toolset
```

## 1.5. INSTALLING RUST DOCUMENTATION

The *The Rust Programming Language* book is available as installable documentation.

### Prerequisites

- Rust Toolset is installed.  
For more information, see [Installing Rust Toolset](#).

### Procedure

To install the **rust-doc** package, run the following command:

- On Red Hat Enterprise Linux 7:

```
# yum install rust-toolset-1.66-rust-doc
```

You can find the *The Rust Programming Language* book under the following path: **/opt/rh/rust-toolset-1.66/root/usr/share/doc/rust/html/index.html**.

You can find the API documentation for all Rust code packages under the following path: **/opt/rh/rust-toolset-1.66/root/usr/share/doc/rust/html/std/index.html**.

- On Red Hat Enterprise Linux 8:

```
# yum install rust-doc
```

You can find the *The Rust Programming Language* book under the following path:  
**/usr/share/doc/rust/html/index.html**.

You can find the API documentation for all Rust code packages under the following path:  
**/usr/share/doc/rust/html/std/index.html**.

- On Red Hat Enterprise Linux 9:

```
# dnf install rust-doc
```

You can find the *The Rust Programming Language* book under the following path:  
**/usr/share/doc/rust/html/index.html**.

You can find the API documentation for all Rust code packages under the following path:  
**/usr/share/doc/rust/html/std/index.html**.

## 1.6. INSTALLING CARGO DOCUMENTATION

The *Cargo, Rust's Package Manager* book is available as installable documentation for Cargo.



### NOTE

From Rust Toolset 1.66, the **cargo-doc** package is included in the **rust-doc** package.

### Prerequisites

- Rust Toolset is installed.  
For more information, see [Installing Rust Toolset](#).

### Procedure

- To install the **cargo-doc** package, run:
  - On Red Hat Enterprise Linux 7:

```
# yum install rust-toolset-1.66-cargo-doc
```

You can find the *Cargo book* under the following path: **/opt/rh/rust-toolset-1.66/root/usr/share/doc/cargo/html/index.html**.

- On Red Hat Enterprise Linux 8:

```
# yum install cargo-doc
```

You can find the *Cargo, Rust's Package Manager* book under the following path:  
**/usr/share/doc/cargo/html/index.html**.

- On Red Hat Enterprise Linux 9:

```
# dnf install cargo-doc
```

You can find the *Cargo, Rust's Package Manager* book under the following path:  
**`/usr/share/doc/cargo/html/index.html`**.

## 1.7. ADDITIONAL RESOURCES

- For more information on the Rust programming language, see the [official Rust documentation](#).

## CHAPTER 2. THE CARGO BUILD TOOL

Cargo is a build tool and front end for the Rust compiler **rustc** as well as a package and dependency manager. It allows Rust projects to declare dependencies with specific version requirements, resolves the full dependency graph, downloads packages, and builds as well as tests your entire project.

Rust Toolset is distributed with Cargo 1.66.1.

### 2.1. THE CARGO DIRECTORY STRUCTURE AND FILE PLACEMENTS

The Cargo build tool uses set conventions for defining the directory structure and file placement within a Cargo package. Running the **cargo new** command generates the package directory structure and templates for both a manifest and a project file. By default, it also initializes a new Git repository in the package root directory.

For a binary program, Cargo creates a directory **project\_name** containing a text file named **Cargo.toml** and a subdirectory **src** containing a text file named **main.rs**.

#### Additional resources

- For more information on the Cargo directory structure, see [The Cargo Book – Package Layout](#).
- For in-depth information about Rust code organization, see [The Rust Programming Language – Managing Growing Projects with Packages, Crates, and Modules](#).

### 2.2. CREATING A RUST PROJECT

Create a new Rust project that is set up according to the Cargo conventions. For more information on Cargo conventions, see [Cargo directory structure and file placements](#).

#### Procedure

Create a Rust project by running the following command:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo new --bin <project_name>'
```

- Replace **<project\_name>** with your project name.

- On Red Hat Enterprise Linux 8:

```
$ cargo new --bin <project_name>
```

- Replace **<project\_name>** with your project name.

- On Red Hat Enterprise Linux 9:

```
$ cargo new --bin <project_name>
```

- Replace **<project\_name>** with your project name.

**NOTE**

To edit the project code, edit the main executable file **main.rs** and add new source files to the **src** subdirectory.

**Additional resources**

- For information on configuring your project and adding dependencies, see [Configuring Rust project dependencies](#).

## 2.3. CREATING A RUST LIBRARY PROJECT

Complete the following steps to create a Rust library project using the Cargo build tool.

**Procedure**

To create a Rust library project, run the following command:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo new --lib <project_name>'
```

- Replace **<project\_name>** with the name of your Rust project.

- On Red Hat Enterprise Linux 8:

```
$ cargo new --lib <project_name>
```

- Replace **<project\_name>** with the name of your Rust project.

- On Red Hat Enterprise Linux 9:

```
$ cargo new --lib <project_name>
```

- Replace **<project\_name>** with the name of your Rust project.

**NOTE**

To edit the project code, edit the source file, **lib.rs**, in the **src** subdirectory.

**Additional resources**

- [Managing Growing Projects with Packages, Crates, and Modules](#)

## 2.4. BUILDING A RUST PROJECT

Build your Rust project using the Cargo build tool. Cargo resolves all dependencies of your project, downloads missing dependencies, and compiles it using the **rustc** compiler.

By default, projects are built and compiled in debug mode. For information on compiling your project in release mode, see [Building a Rust project in release mode](#).

**Prerequisites**

- An existing Rust project.  
For information on how to create a Rust project, see [Creating a Rust project](#).

### Procedure

- To build a Rust project managed by Cargo, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo build'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo build
```

- On Red Hat Enterprise Linux 9:

```
$ cargo build
```

- To verify that your Rust program can be built when you do not need to build an executable file, run:

```
$ cargo check
```

## 2.5. BUILDING A RUST PROJECT IN RELEASE MODE

Build your Rust project in release mode using the Cargo build tool. Release mode is optimizing your source code and can therefore increase compilation time while ensuring that the compiled binary will run faster. Use this mode to produce optimized artifacts suitable for release and production. Cargo resolves all dependencies of your project, downloads missing dependencies, and compiles it using the **rustc** compiler.

For information on compiling your project in debug mode, see [Building a Rust project](#).

### Prerequisites

- An existing Rust project.  
For information on how to create a Rust project, see [Creating a Rust project](#).

### Procedure

- To build the project in release mode, run:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo build --release'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo build --release
```

- On Red Hat Enterprise Linux 9:

```
$ cargo build --release
```

- To verify that your Rust program can be build when you do not need to build an executable file, run:

```
$ cargo check
```

## 2.6. RUNNING A RUST PROGRAM

Run your Rust project using the Cargo build tool. Cargo first rebuilds your project and then runs the resulting executable file. If used during development, the **cargo run** command correctly resolves the output path independently of the build mode.

### Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).

### Procedure

To run a Rust program managed as a project by Cargo, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo run'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo run
```

- On Red Hat Enterprise Linux 9:

```
$ cargo run
```



### NOTE

If your program has not been built yet, Cargo builds your program before running it.

## 2.7. TESTING A RUST PROJECT

Test your Rust program using the Cargo build tool. Cargo first rebuilds your project and then runs the tests found in the project. Note that you can only test functions that are free, monomorphic, and take no arguments. The function return type must be either `()` or **Result<(), E> where E: Error**.

By default, Rust projects are tested in debug mode. For information on testing your project in release mode, see [Testing a Rust project in release mode](#).

### Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).



## Procedure

- Add the test attribute **#[test]** in front of your function.
- To run tests for a Rust project managed by Cargo, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo test'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo test
```

- On Red Hat Enterprise Linux 9:

```
$ cargo test
```

## Additional resources

- For more information on performing tests in your Rust project, see [The Rust Reference – Testing attributes](#).

## 2.8. TESTING A RUST PROJECT IN RELEASE MODE

Test your Rust program in release mode using the Cargo build tool. Release mode is optimizing your source code and can therefore increase compilation time while ensuring that the compiled binary will run faster. Use this mode to produce optimized artifacts suitable for release and production. Cargo first rebuilds your project and then runs the tests found in the project. Note that you can only test functions that are free, monomorphic, and take no arguments. The function return type must be either **()** or **Result<(), E> where E: Error**.

For information on testing your project in debug mode, see [Testing a Rust project](#).

## Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).

## Procedure

- Add the test attribute **#[test]** in front of your function.
- To run tests for a Rust project managed by Cargo in release mode, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo test --release'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo test --release
```

- On Red Hat Enterprise Linux 9:

```
$ cargo test --release
```

### Additional resources

- For more information on performing tests in your Rust project, see [The Rust Reference – Testing attributes](#).

## 2.9. CONFIGURING RUST PROJECT DEPENDENCIES

Configure the dependencies of your Rust project using the Cargo build tool. To specify dependencies for a project managed by Cargo, edit the file **Cargo.toml** in the project directory and rebuild your project. Cargo downloads the Rust code packages and their dependencies, stores them locally, builds all of the project source code including the dependency code packages, and runs the resulting executable.

### Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).

### Procedure

1. In your project directory, open the file **Cargo.toml**.
2. Move to the section labelled **[dependencies]**.  
Each dependency is listed on a new line in the following format:

```
crate_name = version
```

Rust code packages are called crates.

3. Edit your dependencies.
4. Rebuild your project by running:
  - On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo build'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo build
```

- On Red Hat Enterprise Linux 9:

```
$ cargo build
```

5. Run your project by using the following command:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo run'
```

- On Red Hat Enterprise Linux 8:

```
┆ $ cargo run
```

- On Red Hat Enterprise Linux 9:

```
┆ $ cargo run
```

### Additional resources

- For more information on configuring Rust dependencies, see [The Cargo Book – Specifying Dependencies](#).

## 2.10. BUILDING DOCUMENTATION FOR A RUST PROJECT

Use the Cargo tool to generate documentation from comments in your source code that are marked for extraction. Note that documentation comments are extracted only for public functions, variables, and members.

### Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).
- Configured dependencies.  
For more information on configuring dependencies, see [Configuring Rust project dependencies](#).

### Procedure

- To mark comments for extraction, use three slashes `///` and place your comment in the beginning of the line it is documenting.  
Cargo supports the Markdown language for your comments.
- To build project documentation using Cargo, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
┆ $ scl enable rust-toolset-1.66 'cargo doc --no-deps'
```

- On Red Hat Enterprise Linux 8:

```
┆ $ cargo doc --no-deps
```

- On Red Hat Enterprise Linux 9:

```
┆ $ cargo doc --no-deps
```

The generated documentation is located in the `.target/doc` directory.

### Additional resources

- For more information on building documentation using Cargo, see [The Rust Programming Language – Making Useful Documentation Comments](#).

## 2.11. COMPILING CODE INTO A WEBASSEMBLY BINARY WITH RUST ON RED HAT ENTERPRISE LINUX 8 AND RED HAT ENTERPRISE LINUX 9 BETA

Complete the following steps to install the WebAssembly standard library.

### Prerequisites

- Rust Toolset is installed.  
For more information, see [Installing Rust Toolset](#).

### Procedure

- To install the WebAssembly standard library, run:

- On Red Hat Enterprise Linux 8:

```
# yum install rust-std-static-wasm32-unknown-unknown
```

- On Red Hat Enterprise Linux 9:

```
# dnf install rust-std-static-wasm32-unknown-unknown
```

- To use WebAssembly with Cargo, run:

- On Red Hat Enterprise Linux 8:

```
# cargo <command> --target wasm32-unknown-unknown
```

Replace *<command>* with the Cargo command you want to run.

- On Red Hat Enterprise Linux 9:

```
# cargo <command> --target wasm32-unknown-unknown
```

Replace *<command>* with the Cargo command you want to run.

### Additional resources

- For more information on WebAssembly, see the official [Rust and WebAssembly](#) documentation or the [Rust and WebAssembly](#) book.

## 2.12. VENDORING RUST PROJECT DEPENDENCIES

Create a local copy of the dependencies of your Rust project for offline redistribution and reuse using the Cargo build tool. This procedure is called vendoring project dependencies. The vendored dependencies including Rust code packages for building your project on a Windows operating system are located in the **vendor** directory. Vendored dependencies can be used by Cargo without any connection to the internet.

### Prerequisites

- A built Rust project.  
For information on how to build a Rust project, see [Building a Rust project](#).
- Configured dependencies.  
For more information on configuring dependencies, see [Configuring Rust project dependencies](#).

## Procedure

To vendor your Rust project with dependencies using Cargo, run in the project directory:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo vendor'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo vendor
```

- On Red Hat Enterprise Linux 9:

```
$ cargo vendor
```

## 2.13. ADDITIONAL RESOURCES

- For more information on Cargo, see the [Official Cargo Guide](#).
- To display the manual page included in Rust Toolset, run:

- For Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'man cargo'
```

- For Red Hat Enterprise Linux 8:

```
$ man cargo
```

- For Red Hat Enterprise Linux 9:

```
$ man cargo
```

## CHAPTER 3. THE RUSTFMT FORMATTING TOOL

With the **rustfmt** formatting tool, you can automatically format the source code of your Rust programs. You can use **rustfmt** either as a standalone tool or with Cargo.

### 3.1. INSTALLING RUSTFMT

Complete the following steps to install the **rustfmt** formatting tool.

#### Prerequisites

- Rust Toolset is installed.  
For more information, see [Installing Rust Toolset](#).

#### Procedure

Run the following command to install **rustfmt**:

- On Red Hat Enterprise Linux 7:  

```
# yum install rust-toolset-1.66-rustfmt
```
- On Red Hat Enterprise Linux 8:  

```
# yum install rustfmt
```
- On Red Hat Enterprise Linux 9:  

```
# dnf install rustfmt
```

### 3.2. USING RUSTFMT AS A STANDALONE TOOL

Use **rustfmt** as a standalone tool to format a Rust source file and all its dependencies. As an alternative, use **rustfmt** with the Cargo build tool. For more information, see [Using rustfmt with Cargo](#).

#### Prerequisites

- An existing Rust project.  
For information on how to create a Rust project, see [Creating a Rust project](#).

#### Procedure

To format a Rust source file using **rustfmt** as a standalone tool, run the following command:

- On Red Hat Enterprise Linux 7:  

```
$ scl enable rust-toolset-1.66 'rustfmt <source-file>'
```

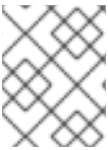
  - Replace **<source\_file>** with the name of your source file.  
Alternatively, you can replace **<source\_file>** with standard input. **rustfmt** then provides its output in standard output.
- On Red Hat Enterprise Linux 8:  
■

```
$ rustfmt <source-file>
```

- Replace **<source\_file>** with the name of your source file. Alternatively, you can replace **<source\_file>** with standard input. **rustfmt** then provides its output in standard output.
- On Red Hat Enterprise Linux 9:

```
$ rustfmt <source-file>
```

- Replace **<source\_file>** with the name of your source file. Alternatively, you can replace **<source\_file>** with standard input. **rustfmt** then provides its output in standard output.



#### NOTE

By default, **rustfmt** modifies the affected files without displaying details or creating backups. To display details and create backups, run **rustfmt** with the **--write-mode value**.

### 3.3. USING RUSTFMT WITH THE CARGO BUILD TOOL

Use the **rustfmt** tool with Cargo to format a Rust source file and all its dependencies. As an alternative, use **rustfmt** as a standalone tool. For more information, see [Using rustfmt as a standalone tool](#).

#### Prerequisites

- An existing Rust project.  
For information on how to create a Rust project, see [Creating a Rust project](#).

#### Procedure

To format all source files in a Cargo code package, run the following command:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'cargo fmt'
```

- On Red Hat Enterprise Linux 8:

```
$ cargo fmt
```

- On Red Hat Enterprise Linux 9:

```
$ cargo fmt
```



#### NOTE

To change the **rustfmt** formatting options, create the configuration file **rustfmt.toml** in the project directory and add your configurations to the file.

### 3.4. ADDITIONAL RESOURCES

- To display the help pages of **rustfmt**, run:

- On Red Hat Enterprise Linux 7:

```
$ scl enable rust-toolset-1.66 'rustfmt --help'
```

- On Red Hat Enterprise Linux 8:

```
$ rustfmt --help
```

- On Red Hat Enterprise Linux 9:

```
$ rustfmt --help
```

- To configure the **rustfmt** tool, edit the file **Configurations.md**.

- On Red Hat Enterprise Linux 7, you can find it under the following path:  
**/opt/rh/rust-toolset-1.66/root/usr/share/doc/rust-toolset-1.66-rustfmt-1.66.1/Configurations.md**
- On Red Hat Enterprise Linux 8, you can find it under the following path:  
**/usr/share/doc/rustfmt/Configurations.md**
- On Red Hat Enterprise Linux 9, you can find it under the following path:  
**/usr/share/doc/rustfmt/Configurations.md**



## CHAPTER 4. CONTAINER IMAGES WITH RUST TOOLSET ON RHEL 8

On RHEL 8, you can build your own Rust Toolset container images on top of Red Hat Universal Base Images (UBI) containers using Containerfiles.

### 4.1. CREATING A CONTAINER IMAGE OF RUST TOOLSET ON RHEL 8

On RHEL 8, Rust Toolset packages are part of the Red Hat Universal Base Images (UBIs) repositories. To keep the container size small, install only individual packages instead of the entire Rust Toolset.

#### Prerequisites

- An existing Containerfile.  
For more information on creating Containerfiles, see the [Dockerfile reference](#) page.

#### Procedure

- Visit the [Red Hat Container Catalog](#).
- Select a UBI.
- Click **Get this image** and follow the instructions.
- To create a container containing Rust Toolset, add the following lines to your Containerfile:

```
FROM registry.access.redhat.com/ubi8/ubi:latest
```

```
RUN yum install -y rust-toolset
```

- To create a container image containing an individual package only, add the following lines to your Containerfile:

```
RUN yum install <package-name>
```

- Replace **<package\_name>** with the name of the package you want to install.

### 4.2. ADDITIONAL RESOURCES

- For more information on Red Hat UBI images, see [Working with Container Images](#).
- For more information on Red Hat UBI repositories, see [Universal Base Images \(UBI\): Images, repositories, packages, and source code](#).

## CHAPTER 5. CHANGES IN RUST 1.66.1 TOOLSET

Rust Toolset has been updated from version 1.62.1 to 1.66.1 on RHEL 7, RHEL 8, and RHEL 9.

Notable changes include:

- The **thread::scope** API creates a lexical scope in which local variables can be safely borrowed by newly spawned threads, and those threads are all guaranteed to exit before the scope ends.
- The **hint::black\_box** API adds a barrier to compiler optimization, which is useful for preserving behavior in benchmarks that might otherwise be optimized away.
- The **.await** keyword now makes conversions with the **IntoFuture** trait, similar to the relationship between **for** and **Intolterator**.
- Generic associated types (GATs) allow traits to include type aliases with generic parameters, enabling new abstractions over both types and lifetimes.
- A new **let-else** statement allows binding local variables with conditional pattern matching, executing a divergent **else** block when the pattern does not match.
- Labeled blocks allow **break** statements to jump to the end of the block, optionally including an expression value.
- **rust-analyzer** is a new implementation of the Language Server Protocol, enabling Rust support in many editors. This replaces the former **rls** package, but you might need to adjust your editor configuration to migrate to **rust-analyzer**.
- Cargo has a new **cargo remove** subcommand for removing dependencies from **Cargo.toml**.

For detailed information regarding the updates, see the series of upstream release announcements:

- [Announcing Rust 1.63.0.](#)
- [Announcing Rust 1.64.0.](#)
- [Announcing Rust 1.65.0.](#)
- [Announcing Rust 1.66.0.](#)