releng-tool

CONTENTS

releng-tool aims to provide a way for developers to tailor the building of multiple software components to help prepare packages for desired runtime environments (e.g. cross-platform portable packages, embedded targets, etc.). When building a package, assets may be located in multiple locations and may require various methods to extract, build and more. releng-tool allows developers to define a set of packages, specifying where resources should be fetched from, how packages should be extracted and the processes for patching, configuring, building and installing each package for a target sysroot.

The structure of a package depends on the specific project. The simplest type is a script-based package, where users can define custom scripts for various stages. A package does not need to handle every stage. Helper package types are available (e.g. Autotools, Cargo, CMake, Make, Meson, various Python types, SCons and Waf) for projects using common build systems.

While releng-tool assists in configuring and building projects, it does not aim to provide a perfect sandbox for the process. Users are responsible for defining the compilers/toolchains used and managing the interaction between the staging/target area with the host system.

CHAPTER

ONE

REQUIREMENTS

releng-tool is developed in Python and requires either Python 3.9+ to run on a host system. A series of optional tools are required if certain stages or features are used. For example, projects fetching sources from Git will require the `git` tool installed; projects with patches will required the `patch` tool. While some features may be operating system-specific (e.g. Autotools features are designed for Linux-based hosts), releng-tool can work on various operating system variants.

CHAPTER

TWO

INSTALLATION

The recommended method of installing/upgrading releng-tool is using pipx:

```
pipx install releng-tool
 (or)
python -m pipx install releng-tool
```

If pipx is not available, users may use pip instead:

```
pip install -U releng-tool
 (or)
python -m pip install -U releng-tool
```

To verify the package has been installed, the following command can be used:

```
releng-tool --version
 (or)
python -m releng-tool --version
```

2.1 Quick-start

The following provides a series of steps to assist in preparing a new environment to use this package.

2.1.1 Linux

While the use of Python/pip is almost consistent between Linux distributions, below is a series of helpful steps to install this package under specific distributions of Linux. From a terminal, invoke the following commands:

Arch

Using `pipx`:

```
$ sudo pacman -Syu
$ sudo pacman -S python-pipx
$ pipx ensurepath
$ pipx install releng-tool
$ releng-tool --version
releng-tool <version>
```

Using `pip`:

```
$ sudo pacman -Sy
$ sudo pacman -S python-pip
$ sudo pip install -U releng-tool
$ releng-tool --version
releng-tool <version>
```

This package is also available on AUR.

Fedora

Using `pipx`:

```
$ sudo dnf install pipx
$ pipx ensurepath
$ pipx install releng-tool
$ releng-tool --version
releng-tool <version>
```

Using `pip`:

```
$ sudo dnf install python-pip
$ sudo pip install -U releng-tool
$ releng-tool --version
releng-tool <version>
```

openSUSE

Using `pip`:

```
$ pip install -U releng-tool
$ releng-tool --version
releng-tool <version>
```

Ubuntu

Using `pipx` (Ubuntu 23.04 or above):

```
$ sudo apt update
$ sudo apt install pipx
$ pipx ensurepath
$ pipx install releng-tool
$ releng-tool --version
releng-tool <version>
```

Using `pip`:

```
$ sudo apt update
$ sudo apt install python-pip
$ sudo pip install -U releng-tool
$ releng-tool --version
releng-tool <version>
```

2.1.2 OS X

From a terminal, invoke the following commands if using `pipx`:

```
$ brew install pipx
$ pipx ensurepath
$ pipx install releng-tool
$ releng-tool --version
releng-tool <version>
```

Or, if using `pip`:

```
$ sudo easy_install pip
$ sudo pip install -U releng-tool
$ releng-tool --version
releng-tool <version>
```

2.1.3 Windows

If not already installed, download the most recent version of Python:

> Python — Downloads
> https://www.python.org/downloads/

When invoking the installer, it is recommended to select the option to "Add Python to PATH". However, users can explicitly invoked Python from an absolute path (the remainder of these steps will assume Python is available in the path).

Open a Windows command prompt and invoke the following:

```
> python -m pip install -U releng-tool
> python -m releng-tool --version
releng-tool ~version~
```

2.2 Development

To install the most recent development sources, the following pip command can be used:

```
pipx install git+https://github.com/releng-tool/releng-tool.git
 (or)
pip install git+https://github.com/releng-tool/releng-tool.git
```

CHAPTER

THREE

GETTING STARTED

This documentation will outline what releng-tool is, how it can be used to create projects with various package definitions, with the end goal of creating release artifacts for a project.

releng-tool is made on Python. Package configurations, scripts, etc. are Python-compatible scripts, which releng-tool accepts for processing configuration files and invoking other tools on a host system. While releng-tool supports running on various host systems (e.g. Linux, OS X, Windows, etc.), this guide will primarily show examples following a Unix-styled file system.

3.1 Running releng-tool

Depending on the host and how releng-tool has been installed, this tool can be either executed using the call `releng-tool` (if supported) or explicitly through a Python invoke `python -m releng-tool`. This guide will assume the former option is available for use. If the alias command is not available on the host system, the latter call can be used instead. For example, the two commands shown below can be considered equivalent:

```
releng-tool --version
 (or)
python -m releng-tool --version
```

3.2 Overview

A project will typically be defined by a `releng-tool.rt` configuration file along with one or more packages found inside a `package/` folder. This location can be referred to as the "root directory".

> **Note**
>
> releng-tool supports using a `.py` extension. For more information, please see alternative extensions.

When invoking `releng-tool`, the tool will look in the current working directory for project information to process. For example, if a folder `my-project` had a skeleton such as:

```
└── my-project/
    ├── package/
    │   └── package-a/
    │       └── ...
    └── releng-tool.rt
```

The following output may be observed when running releng-tool:

```
$ cd my-project
$ releng-tool
extracting package-a...
patching package-a...
configuring package-a...
building package-a...
installing package-a...
generating license information...
(success) completed (0:01:30)
```

On a successful execution, it is most likely that the releng-tool process will have an asset (or multiple) generated into a `images/` location. It is up to the developer of a releng-tool project to decide where generated files will be stored.

If a user wishes to pass the directory of a project location via command line, the argument `--root-dir` can be used:

```
releng-tool --root-dir my-project/
```

For a complete list of actions and other argument options provided by the tool, the `--help` option can be used to show this information:

```
releng-tool --help
```

3.3 Topics

3.3.1 Prelude

A releng-tool project can define multiple packages, each can be based off of different languages, configured to use custom toolchains and more. Every package has multiple stages (such as fetching, configuring, building, etc.) which can help contribute to a target sysroot. Once all packages are processed, the target sysroot can be packaged for distribution.

The following outlines the common directory/file locations for a releng-tool project:

- `cache/` - Cached content from select package sources (e.g. DVCS, etc.)
- `dl/` - Archives for select package sources (e.g. `.tgz`, `.zip`, etc.)
- `package/` - Container for packages
- `package/<package>/` - A package-specific folder
- `package/<package>/<package>.rt` - A package definition
- `output/` - Container for all output content
- `output/build/` - Container for package building
- `output/host/` - Area to hold host-specific content
- `output/images/` - Container for final images/archives
- `output/staging/` - Area to hold staged sysroot content
- `output/target/` - Area to hold target sysroot content
- `releng-tool.rt` - Project configuration

How these directories and files are used can vary on how a developer defines a releng-tool project. Consider the following process:

1. releng-tool will load the project's configuration and respective package definitions to determine what steps need to be performed.
2. Package sources can be downloaded into either the `cache/` or `dl/` folder, depending on what type of sources will be fetched. For example, Git sources will be stored inside of the `cache/` to take advantage of its distributable nature, and archive files (such as `.tgz`, `.zip`, etc.) will be stored inside the `dl/` directory.
3. Each package will be extracted into its own output directory inside `output/build/`. The working areas for packages allow a package to be patched, configured and built based on how the developer configures the respective packages.
4. Once packages are built, their final executables, libraries, etc. can be installed into either the host area (`output/host/`), staging area (`output/staging/`) or the target area (`output/target/`) depending on what has been built. The target area is designed for the final set of assets produced from a build; the intent is that the files contained inside this folder are planned to be used on a target system (stripped, cross-compiled, etc.). A staging area is like a target area but may contain more content such as headers not intended for a final target, interim development assets and more. Host content is designed for content built for the host system which other packages may depend on.
5. At the end of the releng-tool process, a post-stage script can be invoked to help archive/package content from the target area (`output/target/`) into the images folder (`output/images/`). For example, generating an archive `output/images/my-awesome-project-v1.0.0.tgz`.

Not all projects may use each of these folders or take advantage of each stage. While various capabilities exist, it does not mean releng-tool will handle all the nitty-gritty details to make a proper build of a project. For example:

- If a developer wishes to cross-compile a package to a target, they must ensure the package is configured in the proper manner to use a desired toolchain.
- If a developer wants to process a Python package, they must ensure the proper interpreter is used if they cannot rely on the host's default interpreter.
- If a developer creates script-based packages, they must ensure that these scripts properly handle multiple re-invokes (e.g. if a user performs a rebuild on a package).

releng-tool will attempt to provide an easy way to deal with fetching sources, ensuring projects are invoked in order, and more; however, the more advanced features/actions a developer may want in their project (such as the examples mentioned above), the more a developer will need to manage their project.

3.3.2 Tutorials

The following is a series of tutorials which helps covers the basic concepts of releng-tool, as well more advanced use cases.

3.3.2.1 Tutorial "Basic packages"

This tutorial shows an example using very simple script-based packages. This example will make a project with two packages, setup a dependency between them and setup scripts to help show a developer how packages are processed.

To start, make a new folder for the project, folders for each package and move into the root folder:

```
$ mkdir -p my-project/package/liba
$ mkdir -p my-project/package/program-b
$ cd my-project/
```

Inside the `liba` package, a package definition and script-based files will be created. First, build the package definition `my-project/liba/liba.rt` with the following contents:

```
LIBA_VERSION = '1.0.0'
```

Next, create a build script for the `liba` project `my-project/liba/liba-build.rt` with the following contents:

```
print('invoked liba package build stage')
```

Repeat the same steps for the `program-b` package with the file `my-project/program-b/program-b.rt` containing:

```
PROGRAM_B_NEEDS = ['liba']
PROGRAM_B_VERSION = '2.1.0'
```

And `my-project/program-b/program-b-build.rt` containing:

```
print('invoked program-b package build stage')
```

The second package is a bit different since it indicates that package `program-b` has a dependency on `liba`. Configuring a dependency ensures releng-tool will process the `liba` package before `program-b`.

With this minimal set of packages, the project's releng-tool configuration can now be created. At the root of the project, create a `releng-tool.rt` configuration file with the following contents:

```
packages = [
    'program-b',
]
```

The `packages` key indicates a list of required packages to be processed. In this example, we only need to list `program-b` since `liba` will be implicitly loaded through the dependency configuration set in program B's package definition.

The file structure should now be as follows:

```
└── my-project/
    ├── package/
    │   ├── liba/
    │   │   ├── liba.rt
    │   │   └── liba-build.rt
    │   └── program-b/
    │       ├── program-b.rt
    │       └── program-b-build.rt
    └── releng-tool.rt
```

This sample project should be ready for a spin. While in the `my-project` folder, invoke `releng-tool`:

```
$ releng-tool
configuring liba...
building liba...
invoked liba package build stage
installing liba...
configuring program-b...
building program-b...
invoked program-b package build stage
installing program-b...
generating sbom information...
generating license information...
(success) completed (0:00:01)
```

This above output shows that the `liba` stages are invoke followed by `program-b` stages. For the build stage in each package, each respective package script has been invoked. While this example only prints a message, more elaborate scripts can be made to handle a package's source to build.

To clean the project, a `releng-tool clean` request can be invoked:

```
$ releng-tool clean
```

After a `clean` request, the project should be ready to perform a fresh build.

This concludes this tutorial.

3.3.2.2 Tutorial "An SDL example"

> **Note**
>
> The goal of this tutorial is to show an example of C-based project, which is built using a host's pre-installed tools (compilers, etc.). The sample application created will be run on the host system to show the results of a build. Typically, a project would configure/use toolchains to build projects to ensure the resulting files can run on a desired target.

This tutorial shows an example creating a Simple DirectMedia Layer (SDL) sample project, utilizing CMake, which can be built on various platforms (Linux, OS X or Windows). Users of this tutorial can use any platform they desire (commands may vary).

3.3.2.2.1 Preparing

To start, make a new folder for the project, folders for each package and move into the root folder:

```
$ mkdir -p my-sdl-project/package/libsdl
$ mkdir -p my-sdl-project/package/sample
$ cd my-sdl-project/
```

The "libsdl" package will be used to manage the use of SDL, and the "sample" package will be a representation of our sample application that uses the SDL library.

3.3.2.2.2 The libsdl package

Inside the `libsdl` package, create a package definition `my-project/package/libsdl/libsdl.rt` with the following contents:

```
LIBSDL_LICENSE = ['Zlib']
LIBSDL_LICENSE_FILES = ['LICENSE.txt']
LIBSDL_SITE = 'https://www.libsdl.org/release/SDL2-${LIBSDL_VERSION}.tar.gz'
LIBSDL_TYPE = 'cmake'
LIBSDL_VERSION = '2.28.0'

LIBSDL_CONF_DEFS = {
    'SDL_SHARED': 'ON',
    'SDL_STATIC': 'OFF',
    'SDL_TEST': 'OFF',
}
```

- The SDL library uses a zlib license. We configure `LIBSDL_LICENSE` to the equivalent SPDX license identifier, as well as define `LIBSDL_LICENSE_FILES` to point to a copy of the license text. Specifying license information is not required, but can be helpful when generating license data or software bill of materials (SBOM) for a project.
- This example uses SDL v2.28, which we set in the `LIBSDL_VERSION` option. The version value is useful for managing output folders and logging versions of packages.
- We specify the location to download sources in `LIBSDL_SITE`. We take advantage of the `LIBSDL_VERSION` configuration to point to the specific version we desire.
- The SDL library uses CMake. This means we can use `LIBSDL_TYPE` to configure the helper type and avoid the need to create configure/build scripts to run CMake for us (since releng-tool will handle this for us).
- This package has a series of custom options available in its library. We use `LIBSDL_CONF_DEFS` to configure various CMake options, for example, disabling unit tests. Configuration options will vary per package.

The above `libsdl` package specifies a remote URL to download library sources. These sources should be validated to ensure data is not corrupted or manipulated. To do this, create a hash file alongside the package definition called `libsdl.hash` with the contents:

```
# gpg verified SDL2-2.28.0.tar.gz.sig | 1528635D8053A57F77D1E08630A59377A7763BE6
sha256 d215ae4541e69d628953711496cd7b0e8b8d5c8d811d5b0f98fdc7fd1422998a␣
↪libsdl-2.28.0.tar.gz
# locally computed
sha256 9928507f684c1965d07f2b6ef4b4723d5efc2f6b4ab731f743a413c51c319927 LICENSE.txt
```

In this hash file, expected hashes for resources can be configured and checked when releng-tool attempts to fetch resources from remote sources. Ideally, hashes provided from a third-party package release can be directly added into

these files (`<hash-type> <hash> <file>`). In this example, SDL provides GPG signatures of their archives. We manually download the archive and signature file to verify its contents. Once verified, we generated our own SHA-256 sum and place it into this hash file (with a helpful comment).

In addition, we also provide a hash of the license document. While not required, this can be useful in detecting if the license of a package changes between versions.

Finally, the following shows an example of a patch scenario. For v2.28 SDL's CMake projects, the library's implementation has trouble when the installation prefix is empty (which releng-tool may set in Windows environments). To help fix the CMake definition, we want to patch it before running a configuration script. Along side the package definition, create a patch `001-empty-prefix-support.patch` with the following contents:

```
diff -u a/CMakeLists.txt b/CMakeLists.txt

CMAKE_INSTALL_PREFIX may be empty, causing the set of bin_prefix_relpath
to fail. To avoid a failure, avoid using CMAKE_INSTALL_PREFIX when empty.

--- a/CMakeLists.txt    2023-06-20 14:27:57.000000000 -0400
+++ b/CMakeLists.txt    2023-06-25 17:41:30.823627100 -0400
@@ -3067,7 +3067,11 @@
 endif()

 set(prefix ${CMAKE_INSTALL_PREFIX})
-file(RELATIVE_PATH bin_prefix_relpath "${CMAKE_INSTALL_FULL_BINDIR}" "$
↪{CMAKE_INSTALL_PREFIX}")
+if(CMAKE_INSTALL_PREFIX STREQUAL "")
+  set(bin_prefix_relpath ${CMAKE_INSTALL_FULL_BINDIR})
+else()
+  file(RELATIVE_PATH bin_prefix_relpath "${CMAKE_INSTALL_FULL_BINDIR}" "$
↪{CMAKE_INSTALL_PREFIX}")
+endif()

 set(exec_prefix "\${prefix}")
 set(libdir "\${exec_prefix}/${CMAKE_INSTALL_LIBDIR}")
```

Without getting into the specifics of the patch, the existence of this patch file will ensure the extracted `CMakeLists.txt` is updated before `libsdl` package performs its configuration stage. This should ensure this third-party library can be built on all the platforms we wish to support.

The following shows the expected file structure at this stage of this tutorial:

```
└── my-sdl-project/
    └── package/
        ├── libsdl/
        │   ├── 001-empty-prefix-support.patch
        │   ├── libsdl.rt
        │   └── libsdl.hash
        └── sample/
```

3.3.2.2.3 The sample package

Next, we will create a "sample" project. The sources for this sample project would typically be stored in a version control system such as a Git repository. To simplify this tutorial, we will utilize a `local` VCS type (typically used for interim development) to help demonstrate the sample project.

Create a package definition `my-sdl-project/sample/sample.rt` with the following contents:

```
SAMPLE_NEEDS = [
    'libsdl',
]

SAMPLE_INTERNAL = True
SAMPLE_TYPE = 'cmake'
SAMPLE_VCS_TYPE = 'local'
```

- We specify a dependency on the `libsdl` package by adding this package in a `SAMPLE_NEEDS` list. One or more packages can be specified here if needed, and will ensure that `libsdl` is built before any attempts to configure/build the sample package.
- This package is then flagged as internal (`SAMPLE_INTERNAL`). We do this since this is our own custom package and flagging an internal package avoids warnings generated for missing license files or hash files (although developers can add hash checks for internal sources if desired).
- The sample program will also be a CMake-based project, so `SAMPLE_TYPE` will be configured.
- Lastly, we will configure the custom `local` type in `SAMPLE_VCS_TYPE` to indicate our implementation will be found inside the package folder (until we can later add it to Git/etc. repository in the future).

Next, we want to create the sample implementation for this demonstration. Inside the `sample` package folder, create the following file structure:

```
└── local/
    ├── src/
    │   └── sample/
    │       └── main.c
    └── CMakeLists.txt
```

With the following contents:

(*CMakeLists.txt*)

```
cmake_minimum_required(VERSION 3.11)

set(BASE_DIR ${CMAKE_CURRENT_SOURCE_DIR})
set(INC_DIR ${BASE_DIR}/src)
set(SRC_DIR ${BASE_DIR}/src/sample)

################################################################################
## support
################################################################################

# targeting c11
set(CMAKE_C_STANDARD 11)
enable_language(C) # msvc hint

# includes
include_directories(${INC_DIR})

set(CMAKE_MACOSX_RPATH 1)
set(CMAKE_INSTALL_RPATH "${CMAKE_INSTALL_PREFIX}/lib")

################################################################################
```

(continues on next page)

(continued from previous page)

```
## dependencies
######################################################################

find_package(SDL2 REQUIRED)
find_package(Threads REQUIRED)

######################################################################
## project
######################################################################

project(sample)

set(SAMPLE_SRCS
    ${SRC_DIR}/main.c
)

add_executable(sample ${SAMPLE_SRCS})
target_link_libraries(sample SDL2::SDL2 SDL2::SDL2main)
target_link_libraries(sample Threads::Threads)
install (TARGETS sample RUNTIME DESTINATION bin)
```

(*main.c*)

```
#include <SDL2/SDL.h>
#include <stdbool.h>
#include <stdio.h>

static void err(const char *format, ...)
{
    fprintf(stderr, "(error) ");
    va_list args;
    va_start(args, format);
    vfprintf(stderr, format, args);
    va_end(args);
    fprintf(stderr, "\n");
    fflush(stderr);
}

int main(void)
{
    SDL_Renderer* renderer;
    SDL_Surface* imgSurface;
    SDL_Texture* imgTexture;
    SDL_Window* window;

    if (SDL_Init(SDL_INIT_VIDEO | SDL_INIT_EVENTS) < 0) {
        err("sdl2 init: %s", SDL_GetError());
        return 1;
    }

    window = SDL_CreateWindow("releng-tool",
        SDL_WINDOWPOS_CENTERED, SDL_WINDOWPOS_CENTERED,
```

(continues on next page)

(continued from previous page)

```
        1280, 640, SDL_WINDOW_OPENGL);
    if (window == NULL) {
        err("failed to create window");
        return 1;
    }

    renderer = SDL_CreateRenderer(window, -1, SDL_RENDERER_ACCELERATED);
    if (renderer == NULL) {
        err("failed to create renderer");
        return 1;
    }

    // read the image into a texture
    imgSurface = SDL_LoadBMP("releng-tool.bmp");
    if (imgSurface == NULL) {
        err("failed to load image: %s", SDL_GetError());
        return 1;
    }

    imgTexture = SDL_CreateTextureFromSurface(renderer, imgSurface);
    if (imgTexture == NULL) {
        err("failed to create texture");
        return 1;
    }

    SDL_FreeSurface(imgSurface);

    while (true) {
        // wait until a quit is issued
        SDL_Event e;
        if (SDL_PollEvent(&e)) {
            if (e.type == SDL_QUIT) break;
        }

        // render the image
        SDL_RenderClear(renderer);
        SDL_RenderCopy(renderer, imgTexture, NULL, NULL);
        SDL_RenderPresent(renderer);
    }

    // cleanup
    SDL_DestroyTexture(imgTexture);
    SDL_DestroyRenderer(renderer);
    SDL_DestroyWindow(window);
    SDL_Quit();

    return 0;
}
```

Without getting into specifics of this sample program, the overall goal is to have an SDL program create a window and show an image.

The following shows the expected file structure at this stage of this tutorial:

```
└── my-sdl-project/
    └── package/
        ├── libsdl/
        │   ├── 001-empty-prefix-support.patch
        │   ├── libsdl.rt
        │   └── libsdl.hash
        └── sample/
            ├── local/
            │   ├── src/
            │   │   └── sample/
            │   │       └── main.c
            │   └── CMakeLists.txt
            └── sample.rt
```

3.3.2.2.4 Project configuration and post-build script

The project has both `libsdl` and `sample` packages ready to build. For the `sample` project, the implementation references a `releng-tool.bmp` image to render for a window, which has not yet been setup. This file should be added into the build system and installed into the target in the post-build stages.

Create a new `assets` folder at the root of the project folder. Inside, place a copy of the releng-tool.bmp image. At the root of the project folder, create a post-build script named `releng-tool-post-build.rt` with the following contents:

```
sample_img = ROOT_DIR / 'assets' / 'releng-tool.bmp'
releng_copy_into(sample_img, TARGET_BIN_DIR)
```

- In this example script, we find the project's root path using a `ROOT_DIR` helper to find where we locally store the `releng-tool.bmp` image file.
- We then copy the image into the target directory's bin folder to be placed alongside the executable we plan to build.

Lastly, we need to create our releng-tool configuration file for the project. In the root folder, create a `releng-tool.rt` file with the following contents:

```
packages = [
    'sample',
]

vsdevcmd = True
```

- We explicitly configure releng-tool to load the `sample` package to build.
- Note that we do not need to specify the `libsdl` package since the `sample` package will load it implicitly through its dependency configuration.
- Adding `vsdevcmd` will auto-load Visual Studio developer environment variables to support Windows-based builds.

The following shows the expected file structure at this stage of this tutorial:

```
└── my-sdl-project/
    ├── assets/
    │   └── releng-tool.bmp
    ├── package/
```

(continues on next page)

(continued from previous page)

```
    |   ├── libsdl/
    |   |   ├── 001-empty-prefix-support.patch
    |   |   ├── libsdl.rt
    |   |   └── libsdl.hash
    |   └── sample/
    |       ├── local/
    |       |   ├── src/
    |       |   |   └── sample/
    |       |   |       └── main.c
    |       |   └── CMakeLists.txt
    |       └── sample.rt
    ├── releng-tool.rt
    └── releng-tool-post-build.rt
```

3.3.2.2.5 Performing a build

With packages, assets and configurations prepared, the project should be ready to be built. While in the `my-sdl-project` folder, invoke `releng-tool`:

```
$ releng-tool
fetching libsdl...
requesting: https://www.libsdl.org/release/SDL2-2.28.0.tar.gz
[100%] libsdl-2.28.0.tar.gz: 7.7 MiB of 7.7 MiB
completed download (7.7 MiB)
extracting libsdl...
WhatsNew.txt
Xcode
android-project
VisualC-WinRT
...
patching libsdl...
(001-empty-prefix-support.patch)
patching file CMakeLists.txt
configuring libsdl...
building libsdl...
installing libsdl...
configuring sample...
building sample...
installing sample...
generating sbom information...
generating license information...
(success) completed (0:01:15)
```

3.3.2.2.6 Testing

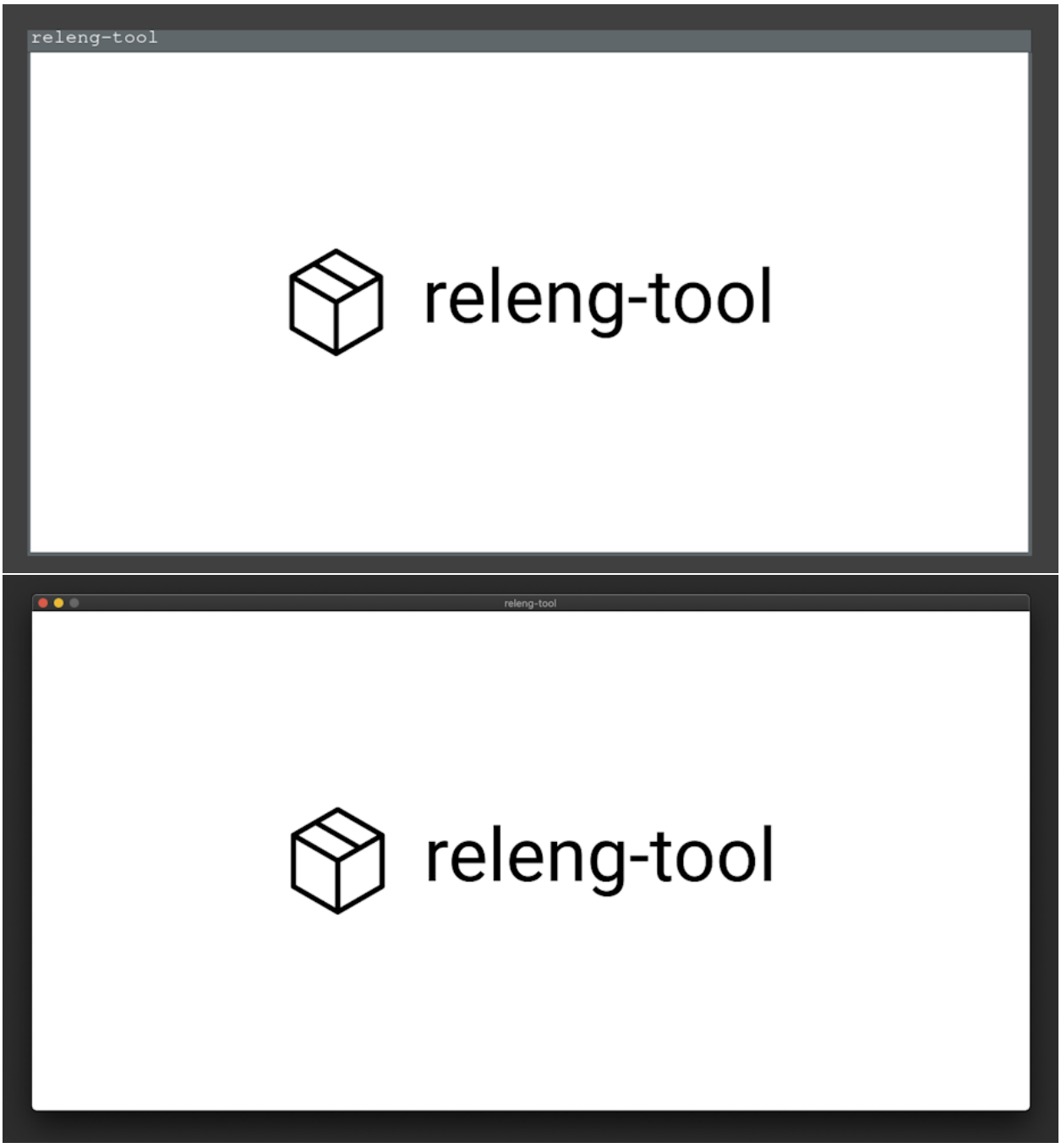
With the project built, we will run the recently created SDL application to verify our initial releng-tool project definitions. With Linux or OS X, navigate to the target directory's bin path and invoke the created sample application:

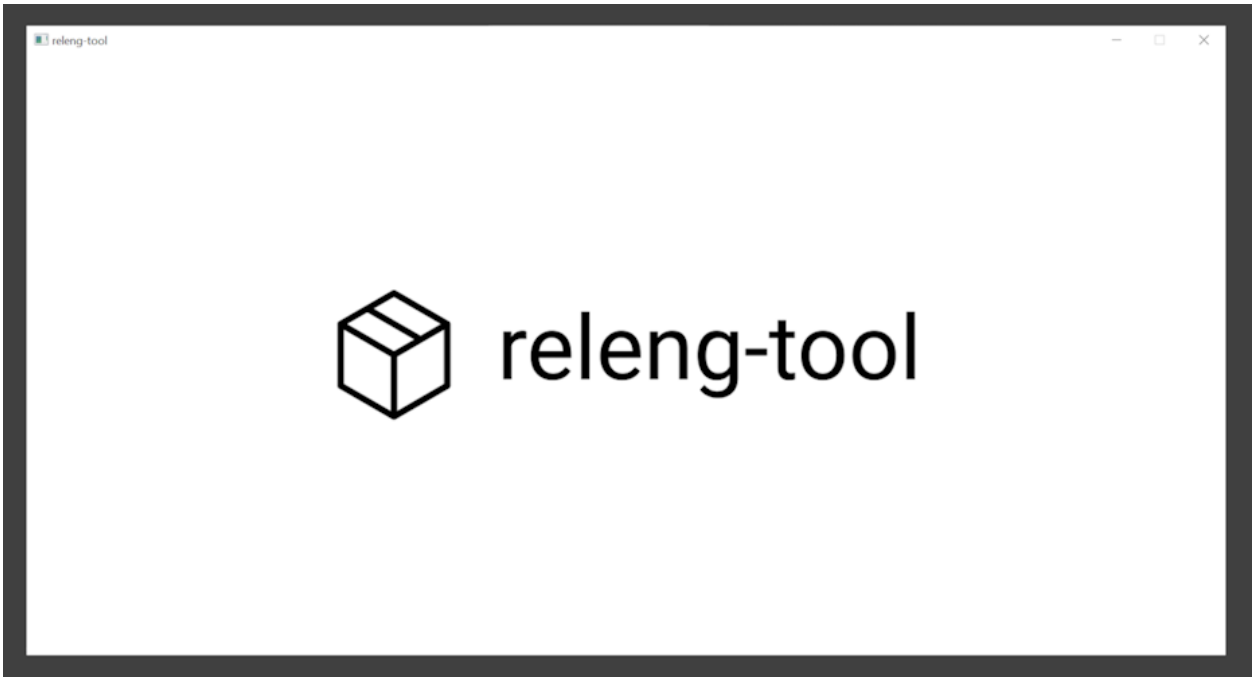
```
$ cd output/target/usr/bin
$ LD_LIBRARY_PATH=../lib ./sample
```

With Windows, users can navigate to `output/target/bin` using the file explorer and click-open the `sample.exe`

executable.

In all cases, a window should be presented with the releng-tool logo:





This concludes this tutorial.

3.3.2.3 Tutorial "A toolchain example"

This tutorial shows an example creating an application using a pre-built toolchain. In this example, we will use a pre-built toolchain which (in theory) has been used to prepare a Linux image for an embedded device. With the same toolchain, we can define a releng-tool project that prepares an application that can run on this embedded device.

This example will attempt to prepare a static build of htop that can run on an aarch64 system.

3.3.2.3.1 Preparing the host environment

> **Note**
>
> A releng-tool project may create a package to download/setup a toolchain package to use for a build. However, for this example, we will keep the installation/availability of the toolchain outside of the releng-tool project (for simplicity of this tutorial).

First, we will prepare a toolchain on a host system to be used by our releng-tool project. For this tutorial, we will use a toolchain provided by Bootlin. Download the following toolchain package:

- Architecture: aarch64
- libc: glibc
- https://toolchains.bootlin.com/…/aarch64–glibc–stable-2022.08-1.tar.bz2
- https://toolchains.bootlin.com/…/aarch64–glibc–stable-2022.08-1.sha256
- (sha256: `844df3c99508030ee9cb1152cb182500bb9816ff01968f2e18591d51d766c9e7`)

Extract and place the toolchain into a desired location. In this example, we will place the toolchain under `/opt`. However, users can install the toolchain to whatever path they desire:

```
$ tar -vxf <toolchain-archive>
$ mv aarch64--glibc--stable-2022.08-1 /opt
$ cd /opt/aarch64--glibc--stable-2022.08-1
$ relocate-sdk.sh
```

Verify the ability to invoke GCC from the toolchain installation:

```
$ /opt/aarch64--glibc--stable-2022.08-1/bin/aarch64-linux-gcc --version
aarch64-linux-gcc.br_real (Buildroot 2021.11-4428-g6b6741b) 11.3.0
Copyright (C) 2021 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

3.3.2.3.2 Preparing a new releng-tool project

To build htop, this requires two dependencies:

- Ncurses
- Netlink Protocol Library Suite (libnl)

Build a new project with the following structure to support our `htop` package, dependencies and project configuration:

```
└── my-tc-project/
    ├── package/
    │   ├── htop/
    │   │   ├── htop.rt
    │   │   └── htop.hash
    │   ├── libnl/
    │   │   ├── libnl.rt
    │   │   └── libnl.hash
    │   └── ncurses/
    │       ├── ncurses.rt
    │       └── ncurses.hash
    └── releng-tool.rt
```

3.3.2.3.3 The configuration

The first changes we will make to our releng-tool project is to define the specifics of the project configuration in `releng-tool.rt`. Apply the following contents to the configuration:

```
packages = [
    'htop',
]

# location of the toolchain to use
MY_TOOLCHAIN_ROOT = '/opt/aarch64--glibc--stable-2022.08-1'
MY_TOOLCHAIN_SYSROOT = releng_join(
    MY_TOOLCHAIN_ROOT, 'aarch64-buildroot-linux-gnu/sysroot')

# flag buildroot toolchain to be strict with includes
releng_env('BR_COMPILER_PARANOID_UNSAFE_PATH', '1')

MY_TOOLCHAIN_CONF_ENV = {
```

(continues on next page)

(continued from previous page)

```
    # configure compiler/linker options
    'CC': f'{MY_TOOLCHAIN_ROOT}/bin/aarch64-linux-gcc',
    'CXX': f'{MY_TOOLCHAIN_ROOT}/bin/aarch64-linux-g++',
    'CFLAGS': f'--sysroot={MY_TOOLCHAIN_SYSROOT} -I${{STAGING_INCLUDE_DIR}}',
    'CXXLAGS': f'--sysroot={MY_TOOLCHAIN_SYSROOT} -I${{STAGING_INCLUDE_DIR}}',
    'LDFLAGS': f'--sysroot={MY_TOOLCHAIN_SYSROOT} -L${{STAGING_LIB_DIR}}',
    # configure pkg-config to use staging directory
    'PKG_CONFIG_DIR': '',
    'PKG_CONFIG_LIBDIR': '${STAGING_LIB_DIR}/pkgconfig',
    'PKG_CONFIG_SYSROOT_DIR': '${STAGING_DIR}',
}

MY_TOOLCHAIN_CONF_DEFS = {
    # configure for cross compiling
    '--host': 'aarch64-buildroot-linux',
}
```

- Create a package list which defines `htop` as a required package to build. Since we plan to make `libnl` and `ncurses` dependencies to `htop`, they do not need to be included.
- This project will rely on the host system having the toolchain installed. We create some variables to help point to the toolchain's path and sysroot. Developers can make this flexible by allowing these options to be configured by environment variables or using command line arguments, but this will not be done here to simplify this tutorial.
- We configure `BR_COMPILER_PARANOID_UNSAFE_PATH`, an option supported by the generated Bootlin (Buildroot) toolchain to error when using an unsafe path when performing a build (i.e. throw an error when using the system's `/usr/include` path over a releng-tool sysroot path).
- Prepares two variables `MY_TOOLCHAIN_CONF_ENV` and `MY_TOOLCHAIN_CONF_DEFS` which we can later use for the Autotools packages we have. These values help configure toolchain and desired releng-tool paths. Variables set in the root configuration can later be used inside package scripts and post-build scripts. The options specified here are applicable to Autotools packages. Options can vary for other types (e.g. CMake projects typically are configured with a CMake toolchain file).

The releng-tool project's configuration is ready. Now to define the package definitions/hashes for each package.

3.3.2.3.4 The libnl package

Update the `libnl` package definition (`my-tc-project/libnl/libnl.rt`) with the following contents:

```
LIBNL_INSTALL_TYPE = 'staging'
LIBNL_LICENSE = ['LGPL-2.1-or-later']
LIBNL_LICENSE_FILES = ['COPYING']
LIBNL_SITE =
↪'https://github.com/thom311/libnl/releases/download/libnl3_7_0/libnl-3.7.0.tar.gz'
LIBNL_TYPE = 'autotools'
LIBNL_VERSION = '3.7.0'

LIBNL_CONF_ENV = MY_TOOLCHAIN_CONF_ENV
LIBNL_CONF_DEFS = MY_TOOLCHAIN_CONF_DEFS

LIBNL_CONF_OPTS = [
    # static lib
    '--enable-static',
```

(continues on next page)

(continued from previous page)

```
    '--disable-shared',
    # disable features that are not required
    '--disable-cli',
    '--disable-debug',
    '--disable-pthreads',
]
```

- The libnl library uses a LGPL-2.1+ license. We configure `LIBNL_LICENSE` to the equivalent SPDX license identifier, as well as define `LIBNL_LICENSE_FILES` to point to a copy of the license text. Specifying license information is not required, but can be helpful when generating license data or software bill of materials (SBOM) for a project.
- This example uses libnl v3.7.0, which we set in the `LIBNL_VERSION` option. The version value is useful for managing output folders and logging versions of packages.
- We specify the location to download sources in `LIBNL_SITE`.
- The libnl library uses Autotools. This means we can use `LIBNL_TYPE` to configure the helper type and avoid the need to create custom configure/build scripts to run `./configure`, etc. (since releng-tool will handle this for us).
- We configure `LIBNL_CONF_ENV` and `LIBNL_CONF_DEFS` to use the configuration options we prepared in the root configuration. This allows this Autotools package to use the desired toolchain.
- This package is configured to install (`LIBNL_INSTALL_TYPE`) into the staging area (instead of, by default, into the target directory). Since we are creating a static library for `htop` to link against, there is no need to place any generated content from the `libnl` package into the target area.
- Finally, we configure `LIBNL_CONF_OPTS` to tweak other options supported by this package. We only need a static library, so we explicitly indicate to enable static builds and disable shared builds. We also disable a series of other features not needed for this example.

  Using configuration options can be useful for disabling certain project options such as disabling unit tests (which may not be desired for these types of builds). It is always good to explicitly define configuration entries when possible, just in case default values change for an option.

The above `libnl` package specifies a remote URL to download library sources. These sources should be validated to ensure data is not corrupted or manipulated. To do this, create a hash file alongside the package definition called `libnl.hash` with the contents:

```
#␣
↪https://github.com/thom311/libnl/releases/download/libnl3_7_0/libnl-3.7.0.tar.gz.sha256sum
sha256 9fe43ccbeeea72c653bdcf8c93332583135cda46a79507bfd0a483bb57f65939␣
↪libnl-3.7.0.tar.gz
# locally computed
sha256 dc626520dcd53a22f727af3ee42c770e56c97a64fe3adb063799d8ab032fe551 COPYING
```

In this hash file, expected hashes for resources can be configured and checked when releng-tool attempts to fetch resources from remote sources. Ideally, hashes provided from a third-party package release can be directly added into these files (`<hash-type> <hash> <file>`). In this example, libnl provides expected hashes for archives when they make a release. We copy the hash contents into our local hash file (with a helpful comment to indicate where it came from).

In addition, we also provide a hash of the license document. While not required, this can be useful in detecting if the license of a package changes between versions.

3.3.2.3.5 The ncurses package

Update the `ncurses` package definition (`my-tc-project/ncurses/ncurses.rt`) with the following contents:

```
NCURSES_INSTALL_TYPE = 'staging'
NCURSES_LICENSE = ['X11']
NCURSES_LICENSE_FILES = ['COPYING']
NCURSES_SITE = 'https://invisible-mirror.net/archives/ncurses/ncurses-$
↪{NCURSES_VERSION}.tar.gz'
NCURSES_TYPE = 'autotools'
NCURSES_VERSION = '6.4'

NCURSES_CONF_ENV = MY_TOOLCHAIN_CONF_ENV
NCURSES_CONF_DEFS = MY_TOOLCHAIN_CONF_DEFS

NCURSES_CONF_OPTS = [
    # static lib
    '--with-normal',
    '--without-shared',
    # disable features that are not required
    '--disable-db-install',
    '--without-ada',
    '--without-curses-h',
    '--without-cxx',
    '--without-cxx-binding',
    '--without-debug',
    '--without-gpm',
    '--without-manpages',
    '--without-progs',
    '--without-sysmouse',
    '--without-tack',
    '--without-tclib',
    '--without-termlib',
    '--without-tests',
]
```

The above almost mimics the previous `libnl` package with the exception of this package having a different license and different configuration options available.

Since `ncurses` package specifies a remote URL to download library sources, we also want to update `ncurses.hash` with the contents:

```
# locally computed after verification with:
#  https://invisible-island.net/archives/ncurses/ncurses-6.4.tar.gz.asc
#  19882D92DDA4C400C22C0D56CC2AF4472167BE03
sha256 6931283d9ac87c5073f30b6290c4c75f21632bb4fc3603ac8100812bed248159␣
↪ncurses-6.4.tar.gz
# locally computed
sha256 63de87399e9fc8860236082b6b0520e068e9eb1fad0ebd30202aa30bb6f690ac COPYING
```

In the previous `libnl` package, maintainers provided an official SHA-256 hash to use for our local hash file. For `ncurses`, maintainers provide a GPG signature of their archives instead. To handle this, we manually download the archive and signature file to verify its contents. Once verified, we generated our own SHA-256 sum and place it into this hash file (with a helpful comment). And as done in the previous package, we also provide a hash of the license document.

3.3.2.3.6 The htop package

Update the `htop` package definition (`my-tc-project/htop/htop.rt`) with the following contents:

```
HTOP_NEEDS = [
    'libnl',
    'ncurses',
]

HTOP_LICENSE = ['GPL-2.0-or-later']
HTOP_LICENSE_FILES = ['COPYING']
HTOP_SITE = 'https://github.com/htop-dev/htop/releases/download/${HTOP_VERSION}/htop-$
↪{HTOP_VERSION}.tar.xz'
HTOP_TYPE = 'autotools'
HTOP_VERSION = '3.2.2'

HTOP_CONF_ENV = MY_TOOLCHAIN_CONF_ENV
HTOP_CONF_DEFS = MY_TOOLCHAIN_CONF_DEFS

HTOP_CONF_OPTS = [
    # disable features that are not required
    '--disable-capabilities',
    '--disable-dependency-tracking',
    '--disable-hwloc',
    '--disable-openvz',
    '--disable-pcp',
    '--disable-sensors',
    '--disable-unicode',
    '--disable-vserver',
]
```

- This package defines a list of package dependencies for `htop`. Specifically, we list `libnl` and `ncurses`, which will force releng-tool to configure/build these packages before processing the `htop` package.

Since `htop` package specifies a remote URL to download library sources, we also want to update `htop.hash` with the contents:

```
# https://github.com/htop-dev/htop/releases/download/3.2.2/htop-3.2.2.tar.xz.sha256
sha256 bac9e9ab7198256b8802d2e3b327a54804dc2a19b77a5f103645b11c12473dc8␣
↪htop-3.2.2.tar.xz
# locally computed
sha256 8177f97513213526df2cf6184d8ff986c675afb514d4e68a404010521b880643 COPYING
```

3.3.2.3.7 Performing a build

With a configuration and packages prepared, the project should be ready to be built. While in the `my-tc-project` folder, invoke `releng-tool`:

```
$ releng-tool
fetching libnl...
configuring libnl...
building libnl...
...
building htop...
```

(continues on next page)

(continued from previous page)

```
installing htop...
generating sbom information...
generating license information...
(success) completed (0:01:15)
```

Once completed, the target directory will have a compiled `htop` executable that can be copied over to and run on an aarch64-running target.

This concludes this tutorial.

3.3.3 Understanding rebuilds

- Completed stages for a package are not executed again when releng-tool is re-run.
- Users looking to re-run a completed stage for a specific package need to manually re-trigger the stage (e.g. `releng-tool <pkg>-rebuild`, `releng-tool <pkg>-reconfigure`, `releng-tool <pkg>-reinstall`).
- Users can also invoke `releng-tool punch` for force re-trigger all package stages.

3.3.3.1 Details

As packages are processed in order (based off of detected dependencies, if any), each package will go through their respective stages:

1. Fetching
2. Extraction
3. Patching
4. Configuration
5. Building
6. Installation

While a package may not take advantage of each stage, the releng-tool will step through each stage to track its progress. Due to the vast number of ways a package can be defined, the ability for releng-tool to determine when a previously executed stage is "stale" is non-trivial. Instead of attempting to manage "stale" package stages, releng-tool leaves the responsibility to the builder to deal with these scenarios. This idea is important for developers to understand how it is possible to perform rebuilds of packages to avoid a full rebuild of the entire project.

Consider the following example: a project has three packages which are C++-based packages:

```
└── my-releng-tool-project/
    ├── package/
    │   ├── module-a/
    │   │   └── ...
    │   ├── module-b/
    │   │   └── ...
    │   └── module-c/
    │       └── ...
    └── releng-tool.rt
```

For this example, project `module-b` depends on `module-a` and project `module-c` depends on `module-b`. Therefore, releng-tool will process packages in the order `module-a -> module-b -> module-c`. In this example, the project is built until a failure is detected in package `module-c`:

```
$ releng-tool
[module-a built]
[module-b built]
ERROR: unable to build module-c
```

A developer notices that it is due to an issue found in `module-b`; however, instead of attempting to redo everything from a fresh start, the developer wishes to test the process by manually making local changes in `module-b` to complete the build process. The developer makes the change, re-invokes `releng-tool` but still notices the build error occurs:

```
$ releng-tool
ERROR: unable to build module-c
```

The issue here is that since `module-b` has already been processed, none of the interim changes made will be available for `module-c` to use. To take advantage of the new implementation in `module-b`, the builder can signal for the updated package to be rebuilt:

```
$ releng-tool module-b-rebuild
[module-b rebuilt]
```

With `module-b` in a more desired state, a re-invoke of `releng-tool` can allow `module-c` to be built.

```
$ releng-tool
[module-c built]
```

This is a very simple example to consider, and attempts to rebuild can vary based on the packages, changes made and languages used.

3.3.4 Understanding fetching

The first stage packages go through is the "fetch" phase. For packages which have content to acquire, files can be downloaded or version control sources may be locally cached. For example, if a package has a link to a file to download:

```
LIBFOO_SITE = 'https://example.com/libfoo-1.0.tgz'
```

The file will be stored in the download folder, ready to be used for extraction:

```
└── my-project/
    ├── dl/
    │   └── libfoo/
    │       └── libfoo-1.0.tgz       <----
    ├── package/
    │   └── libfoo/
    │       └── ...
    └── releng-tool.rt
```

And for DVCS-based sites:

```
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
```

The contents of the repository will be stored in the cache folder for later use:

```
└── my-project/
    ├── cache/
```

(continues on next page)

(continued from previous page)

```
    │   └── libfoo/
    │       └── ...                   <----
    ├── package/
    │   └── libfoo/
    │       └── ...
    └── releng-tool.rt
```

Once a package has completed its fetch stage, releng-tool should never need to remotely fetch content for that package again (until site, version, etc. changes). In the event that a user invokes a `clean` action followed by a full build:

```
$ releng-tool clean
$ releng-tool
...
```

No fetching may occur since package contents may already be stored in the existing `dl/` and `cache/` folders.

A problem a user may experience is if they wish to re-acquire sources from a site if they know the sources have changed. For example, if a remote archive has been updated, if a tag has been moved or if a target branch has been updated. The following will present a series of ways a user can deal with these use cases.

3.3.4.1 Start fresh!

> **Tip**
>
> While this approach ensures the most recent sources for the existing package configurations are fetched, it can be time consuming to clear the entire cache if, for example, only a single package has changed.
>
> It is recommended to look at all available options to re-fetch content.

The easiest way to ensure all fresh sources are downloaded is to clean all local downloads/cache for a project. This can be achieved using `distclean`:

```
releng-tool distclean
```

This will ensure all downloaded files, cached content, etc. are removed from the local system, ensuring a next-build to download fresh sources.

3.3.4.2 Full fetching

Changed in version 1.4: Post-fetching will occur after the patching stage instead of the extraction phase.

Most package sources are acquired during the fetch stage. However, some packages define dependencies within their sources. This can require releng-tool to first fetch a defined package's sources, extract the package, followed by fetching any defined dependencies. Post-fetching will be automatically performed for supported packages (e.g. Cargo) after their patch stage. Users can invoke the `fetch-full` action to explicitly process releng-tool's fetch-post operations:

```
releng-tool fetch-full
```

3.3.4.3 Force re-fetch of DVCS sources

When a DVCS-based package goes through its fetch stage, the contents can be locally stored in the configured cache directory. For a package definition as follows:

```
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
LIBFOO_REVISION = 'v1.0'
```

A cache of the `v1.0` tag will be fetched and stored locally. If a package is cleaned and rebuilt again, releng-tool will referred to the locally cached tag. In the event that the remote site changes the tag location, clean builds will not be using the most recent tag location. If a user knows the reference for a site has been updated, they can explicitly request a `<pkg>-fetch` on a package which should trigger a forced update from the remote site. For example:

```
releng-tool libfoo-fetch
```

The above can recognize the new tag update, and any future clean builds made will use the new reference implementation.

3.3.4.4 Force re-fetch of fixed sources

For packages which reference a fixed artifact, once a package has completed its fetch stage, the artifact will no longer need to be downloaded again. For example:

```
LIBFOO_SITE = 'https://example.com/libfoo-1.0.tgz'
```

The archive `libfoo-1.0.tgz` will be locally store and used in future builds. In the event where a site's archive is known to have been changed, a user can force re-fetch these artifacts by using the `<pkg>-fetch` action along with the `-F, --force` argument. For example, even if `libfoo-1.0.tgz` was already downloaded locally, a request as follows will delete the local cache file and re-download it from the configured site:

```
releng-tool libfoo-fetch --force
```

3.3.4.5 Automatically re-fetch development branches

When operating in development mode where a package has a development-specific source based off a branch, it may be preferred to always ensure the most recent sources are fetched. For example, consider `libfoo` with a development revision `main`:

```
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
LIBFOO_REVISION = 'v1.0'
LIBFOO_DEVMODE_REVISION = 'main'
```

With the above configuration, if a builder cleans and rebuilds the project, the originally cache of `main` would still be used, even if `main` has new updates on the remote branch:

```
$ releng-tool
...
~using libfoo hash 1b100c825307730e2027398d70af7c84ce173238~
...
$ releng-tool clean
$ releng-tool
...
~still using libfoo hash 1b100c825307730e2027398d70af7c84ce173238~
...
```

If a user wants to automatically re-fetch new updates on a development branch, they can take advantage of the `LIBFOO_DEVMODE_IGNORE_CACHE` option. For example, if a site definition had:

```
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
LIBFOO_REVISION = 'v1.0'
LIBFOO_DEVMODE_REVISION = 'main'
LIBFOO_DEVMODE_IGNORE_CACHE = True
```

A repeat of the rebuild actions will result in an automatic update of the package's `main` branch (if updates are available):

```
$ releng-tool
...
~using libfoo hash 1b100c825307730e2027398d70af7c84ce173238~
...
$ releng-tool clean
$ releng-tool
...
~using libfoo hash 4cd6375c7464b6bdf166b4f27d5e2fbd937e4ad0~
...
```

CHAPTER

FOUR

USER GUIDES

The following lists a series of guides which can help a user understand and utilize all capabilities of releng-tool.

4.1 Arguments

The command line can be used to specify a single action to perform or provide various options to configure the releng-tool process. Options can be provided before or after an action (if an explicit action is provided). By default, if a user does not specify an action, it is assumed that all steps are to be performed.

```
releng-tool <options> [action]
```

4.1.1 Global actions

The following outlines available global actions:

4.1.1.1 `clean`

Clean (removes) a series of folders holding content such as extracted archives, built libraries and more.

```
releng-tool clean
```

Images and downloaded assets/cache are not removed (see `mrproper` for a more through all cleaning operation). This clean operation will remove files based off the configured output directory. If an output directory is provided (i.e. `--out-dir <dir>`) during a clean event, select folders inside this directory will be removed instead of the output directory (if any) found in the root directory.

See also the `distclean`, `mrproper` and `<pkg>-clean` actions.

4.1.1.2 `distclean`

Added in version 0.6.

Perform a more extreme pristine clean of the releng-tool project.

```
releng-tool distclean
```

This request removes the `cache/`, `dl/` and `output/` directories found in the root directory or overridden by respective arguments, as well as any mode file flags which may be set. See also the `clean` or `mrproper` actions.

See also the `clean`, `mrproper` and `<pkg>-distclean` actions.

4.1.1.3 `extract`

All packages will be processed up to the extraction phase (inclusive).

```
releng-tool extract
```

See also the `<pkg>-extract` action.

4.1.1.4 `fetch`

All packages will be processed up to the fetch phase (inclusive).

```
releng-tool fetch
```

> **Tip**
>
> When a `fetch` is explicitly requested for DVCS sources (e.g. Git), the local cache kept for the repository will be updated against the configured remote. This can be helpful for packages which use a branch for their target revision, or wishing to use a tag which has been moved.
>
> Users may also take advantage of explicit re-fetching of downloaded artifacts when using this action in combination with the --force, -F argument.

See also offline builds, the `fetch-full` action and the `<pkg>-fetch` action.

4.1.1.5 `fetch-full`

Added in version 1.3.

All packages will be processed up to the extraction phase, as well as any post-extraction fetch operations for supported package types (e.g. fetching Cargo dependencies).

```
releng-tool fetch-full
```

See also the `fetch` and `<pkg>-fetch-full` actions.

4.1.1.6 `init`

Added in version 0.6.

Initialize an empty root directory with a sample project.

```
releng-tool init
```

4.1.1.7 `licenses`

A request to generate all license information for the project.

```
releng-tool licenses
```

Note that license information requires acquiring license documents from packages. Therefore, packages will be fetched/extracted if not already done.

See also the `<pkg>-license` action.

4.1.1.8 `lint`

Added in version 2.7.

A request to lint the quality of a project.

```
releng-tool lint
```

To ignore lines based on preference or false-positives, lines can be commented with a `noqa` keyword to not be flagged. For example:

```
UNEXPECTED_KEY = True  # noqa
```

See also the `<pkg>-lint` action.

4.1.1.9 `mrproper`

Added in version 0.6.

Perform a pristine clean of the releng-tool project.

```
releng-tool mrproper
```

This request removes the `output/` directory found in the root directory or overridden by the `--out-dir` argument, as well as any mode file flags which may be set. The `cache/` and `dl/` directories will remain untouched.

See also the `clean` and `distclean` actions.

4.1.1.10 `patch`

All packages will be processed up to the patch phase (inclusive).

```
releng-tool patch
```

See also Patching and the `<pkg>-patch` action.

4.1.1.11 `printvars`

Added in version 2.7.

Print configuration variables associated with the project.

```
releng-tool printvars
```

Printed variables will also note whether the variable is known to be set in the active configuration/execution context.

See also the `<pkg>-printvars` action.

4.1.1.12 `punch`

Added in version 1.2.

A punch request acts in a similar fashion as if no global action was provided. All configured packages will be processed to their completion and any post actions will be run. The difference between a default run and a punch run is when a punch run is requested, any packages that have already been processed will be re-invoked as if a re-configuration request has been made.

This allows a developer to easily attempt to rebuild all packages in their project when multiple packages have been updated.

```
releng-tool punch
```

4.1.1.13 `sbom`

Added in version 0.14.

A request to generate a software build of materials (SBOM) for the project.

```
releng-tool sbom
```

By default, a releng-tool run will generate an SBOM file at the end of a run. This action can be used to generate an SBOM without requiring a build.

See also `--sbom-format <fmt>` (argument) and `sbom_format` (configuration).

4.1.1.14 `state`

Added in version 0.17.

A request to dump active state information for a project.

```
releng-tool state
```

A state request can be used to dump any active configuration and operating modes.

4.1.2 Package actions

The following outlines available package-specific actions:

4.1.2.1 `<pkg>-build`

Performs the build stage for the package.

```
releng-tool <pkg>-build
```

On success, the specified package will have completed its build. If a package has any package dependencies, these dependencies will be processed before the specified package. If the provided package name does not exist, a notification will be generated.

4.1.2.2 `<pkg>-clean`

Cleans the build directory for package (if it exists).

```
releng-tool <pkg>-clean
```

See also the `clean` and `<pkg>-distclean` actions.

4.1.2.3 `<pkg>-configure`

Performs the configure stage for the package.

```
releng-tool <pkg>-configure
```

On success, the specified package will have completed its configuration stage. If a package has any package dependencies, these dependencies will be processed before the specified package. If the provided package name does not exist, a notification will be generated.

4.1.2.4 `<pkg>-distclean`

Added in version 0.8.

Perform a pristine clean of a releng-tool package.

```
releng-tool <pkg>-distclean
```

This request not only removes the build directory but also any cached file or directory associated with the package.

See also the `distclean` and `<pkg>-clean` actions.

4.1.2.5 <pkg>-exec "<cmd>"

Added in version 0.12.

Changed in version 1.4: Support accepting arguments after `--`.

Changed in version 2.5: When using `--` with this call, `releng_args` is no longer populated.

Invokes a provided command in the package's build output directory. This package action can be useful for developers attempting to develop/debug a specific package, allowing an easy way to issue commands in a package's directory without having to manually venture to a package's output directory. Packages will need to be processed to at least the patch stage before a provided command is issued.

An example is as follows:

```
releng-tool libfoo-exec "mycmd arg1 arg2"
```

Alternatively, arguments can be passed using the format:

```
releng-tool libfoo-exec -- mycmd arg1 arg2
```

Package environment variables will be available for the invoked command.

See also `RELENG_EXEC` (environment) and `releng_args` (configuration).

4.1.2.6 <pkg>-extract

Performs the extraction stage for the package.

```
releng-tool <pkg>-extract
```

On success, the specified package will have completed its extraction stage. If the provided package name does not exist, a notification will be generated.

See also the `extract` action.

4.1.2.7 <pkg>-fetch

Performs the fetch stage for the package.

```
releng-tool <pkg>-fetch
```

On success, the specified package stage will have completed its fetch stage. If the provided package name does not exist, a notification will be generated.

See also the `fetch` and `<pkg>-fetch-full` actions.

4.1.2.8 <pkg>-fetch-full

Added in version 1.3.

Performs the fetch and extraction stages for the package, as well as any post-extraction fetch operations for the supported package type (e.g. fetching Cargo dependencies).

```
releng-tool <pkg>-fetch-full
```

If the provided package name does not exist, a notification will be generated.

See also the `fetch-full` and `<pkg>-fetch` actions.

4.1.2.9 <pkg>-fresh

Added in version 1.4.

Prepares a package to be ready to invoke its configuration stage. A successful end state results in the specified package will have completed its patch stage. If the package has already been processed before, it will be cleaned ahead of time to start fresh.

```
releng-tool <pkg>-fresh
```

If the provided package name does not exist, a notification will be generated.

4.1.2.10 <pkg>-install

Performs the installation stage for the package.

```
releng-tool <pkg>-install
```

On success, the specified package will have completed its installation stage. If a package has any package dependencies, these dependencies will be processed before the specified package. If the provided package name does not exist, a notification will be generated.

4.1.2.11 <pkg>-license

Added in version 0.8.

A request to generate the license information for a specific package in a project.

```
releng-tool <pkg>-license
```

Note that license information requires acquiring license documents from the package itself. Therefore, the package will be fetched/extracted if not already done.

See also the `licenses` action.

4.1.2.12 <pkg>-lint

Added in version 2.7.

A request to lint the quality of a specific package in a project.

```
releng-tool <pkg>-lint
```

See also the `lint` action.

4.1.2.13 <pkg>-patch

Performs the patch stage for the package.

```
releng-tool <pkg>-patch
```

On success, the specified package will have completed its patch stage. If the provided package name does not exist, a notification will be generated.

See also Patching and the `patch` action.

4.1.2.14 <pkg>-printvars

Added in version 2.7.

Print configuration variables associated with the package.

```
releng-tool <pkg>-printvars
```

Printed variables will also note whether the variable is known to be set in the active configuration/execution context.

See also the `printvars` action.

4.1.2.15 <pkg>-rebuild

Force a rebuild of a specific package.

```
releng-tool <pkg>-rebuild
```

Once a package has been built, the package will not attempt to be built again. Invoking a rebuild request will tell releng-tool to re-invoke the build step again. This can be useful during times of development where a developer attempts to change a package definition or sources between build attempts. After completing a rebuild, releng-tool will perform the remaining stages of the package (i.e. the installation phase). Users wishing to perform only the rebuild stage are recommended to use `<pkg>-rebuild-only` instead.

If using this action, ensure understanding rebuilds has been read to understand this action's effect.

4.1.2.16 <pkg>-rebuild-only

Added in version 0.7.

Force a rebuild of a specific package.

```
releng-tool <pkg>-rebuild-only
```

Once a package has been built, the package will not attempt to be built again. Invoking a rebuild request will tell releng-tool to re-invoke the build step again. This can be useful during times of development where a developer attempts to change a package definition or sources between build attempts. After completing a rebuild, releng-tool will stop and perform no other changes. Users wishing to perform a rebuild to the installation phase are recommended to use `<pkg>-rebuild` instead.

If using this action, ensure understanding rebuilds has been read to understand this action's effect.

4.1.2.17 <pkg>-reconfigure

Force a re-configuration of a specific package.

```
releng-tool <pkg>-rebuild-reconfigure
```

Once a package has been configured, the package will not attempt to configure it again. Invoking a re-configuration request will tell releng-tool to re-invoke the configuration step again. This can be useful during times of development where a developer attempts to change a package definition or sources between configuration attempts. After completing a re-configuration, releng-tool will perform the remaining stages of the package (i.e. all the way to the installation phase). Users wishing to perform only the re-configuration stage are recommended to use `<pkg>-reconfigure-only` instead.

If using this action, ensure understanding rebuilds has been read to understand this action's effect.

4.1.2.18 `<pkg>-reconfigure-only`

Added in version 0.7.

Force a re-configuration of a specific package.

```
releng-tool <pkg>-reconfigure-only
```

Once a package has been configured, the package will not attempt to configure it again. Invoking a re-configuration request will tell releng-tool to re-invoke the configuration step again. This can be useful during times of development where a developer attempts to change a package definition or sources between configuration attempts. After completing a re-configuration, releng-tool will stop and perform no other changes. Users wishing to perform a re-configuration to the installation phase are recommended to use `<pkg>-reconfigure` instead.

If using this action, ensure understanding rebuilds has been read to understand this action's effect.

4.1.2.19 `<pkg>-reinstall`

Force a re-installation of a specific package.

```
releng-tool <pkg>-reinstall
```

Once a package has been installed, the package will not attempt to install it again. Invoking a re-installation request will tell releng-tool to re-invoke the installation step again. This can be useful during times of development where a developer attempts to change a package definition or sources between installation attempts.

If using this action, ensure understanding rebuilds has been read to understand this action's effect.

4.1.3 Option arguments

The following outlines available options:

4.1.3.1 `--assets-dir <dir>`

Added in version 0.10.

Directory to hold cache and download folders instead of using a configured root directory.

> **Note**
>
> Configuring an asset directory override is only helpful when attempting to configure a container for all assets. If a user also specifies `--cache-dir` or `--dl-dir` overrides, this argument has no effect.

See also `RELENG_ASSETS_DIR`.

4.1.3.2 `--cache-dir <dir>`

Directory for distributed version control cache information (defaults to `<root>/cache`).

See also `RELENG_CACHE_DIR`.

4.1.3.3 `--config <file>`

Added in version 0.13.

Configuration file to load (defaults to `<root>/releng-tool.rt`).

See also alternative extensions that may apply when detecting the default configuration file.

4.1.3.4 `--debug`

Show debug-related messages.

See also `RELENG_DEBUG`.

4.1.3.5 `--debug-extended`

Show extended debug-related messages, such as process execution arguments and environment variables.

4.1.3.6 `--development [<mode>], -D [<mode>]`

Changed in version 0.13: Support configurable modes.

Enables development mode.

See also `RELENG_DEVMODE`.

4.1.3.7 `--dl-dir <dir>`

Directory for download archives (defaults to `<root>/dl`).

See also `DL_DIR` and `RELENG_DL_DIR`.

4.1.3.8 `--force, -F`

Added in version 0.11.

Triggers a forced request for the releng-tool invoke. This entails:

- Packages will be processed as if a re-configuration request has been made.
- If an explicit fetch request is made (`fetch` or `<pkg>-fetch`), any packages which cache to a file will have their cache files deleted to be re-fetched.

See also `RELENG_FORCE`.

4.1.3.9 `--help, -h`

Show a list of all arguments available by releng-tool.

4.1.3.10 `--images-dir <dir>`

Added in version 0.13.

Directory for image outputs (defaults to `<root>/output/images`).

See also `IMAGES_DIR` and `RELENG_IMAGES_DIR`.

4.1.3.11 `--jobs <jobs>, -j <jobs>`

Changed in version 2.9: Added support for negative jobs.

Numbers of jobs to handle (defaults to `0`; automatic).

If the total number of jobs provided is negative, it will subtract the provided value from the automatic job detection count (to a minimum of one).

See also `RELENG_PARALLEL_LEVEL`.

4.1.3.12 `--local-sources [[<pkg>:]<dir>],-L [[<pkg>:]<dir>]`

Changed in version 0.13: Support configurable packages and directories.

Changed in version 0.16: Support `:` (new) or `@` (original) as a separator.

Enables local-sources mode.

Without a directory provided, sources of internal packages will be looked for in the parent directory of the configured root directory. Users may use this argument multiple times to override the local-sources configuration. If a package-specific override is provided, sources for that package will be looked for inside the provided path.

4.1.3.13 `--nocolorout`

Explicitly disable colorized output.

> **Tip**
>
> Added in version 0.17: Added `NO_COLOR` support.
>
> Added in version 2.7: Added `FORCE_COLOR` support.
>
> releng-tool respects the `NO_COLOR` and `FORCE_COLOR` environment variables, if configured in the running environment.

4.1.3.14 `--only-mirror`

Added in version 2.0.

Only fetch external projects with configured mirror.

When releng-tool is fetching sources with `url_mirror` configured, package downloads will be first attempted on the mirror before using their package-defined site. If a developer wishes to enforce a build to only download external packages from the configured mirror, this option can be provided when invoking releng-tool.

4.1.3.15 `--out-dir <dir>`

Directory for output (builds, images, etc.; defaults to `<root>/output`).

See also `RELENG_OUTPUT_DIR`.

4.1.3.16 `--profile [<profile>],-P [<profile>]`

Added in version 2.5.

Configure a profile to run with. Providing this option is only applicable if a project accepts custom profile options. Multiple profiles can be provided by repeating this argument. Multiple profiles can also be provided in a single argument where profiles are separated by a comma (`,`) or a semicolon (`;`).

See also using profiles.

4.1.3.17 `--relaxed-args`

Added in version 1.3.

Do not throw an error when releng-tool is provided unknown arguments.

See also `RELENG_IGNORE_UNKNOWN_ARGS`.

4.1.3.18 `--root-dir <dir>`, `-R <dir>`

Directory to process a releng-tool project. By default, the root directory is configured to the working directory.

See also `ROOT_DIR`.

4.1.3.19 `--success-exit-code <code>`

Added in version 2.8.

Allows overriding the exit code reported on a successful run. By default, a successful run will have an exit code of `0`.

4.1.3.20 `--sbom-format <fmt>`

Added in version 0.14.

Changed in version 2.4: `rdp-spdx` renamed to `rdf-spdx`.

The format to use when generating a software build of materials (SBOM). Multiple formats can be provided (comma-separated).

Type	Value
CSV	`csv`
HTML	`html`
JSON	`json`
JSON (SPDX)	`json-spdx`
RDF (SPDX)	`rdf-spdx`
Text	`text` (default)
XML	`xml`

See also `sbom` (action) and `sbom_format` (configuration).

4.1.3.21 `--quirk <quirk-id>`

Added in version 0.4.

Allows specifying a runtime quirk for the releng-tool process. This option can be used multiple times to apply multiple quirks.

4.1.3.22 `--verbose`, `-V`

Show additional messages.

See also `RELENG_VERBOSE`.

4.1.3.23 `--version`

Show releng-tool's version.

4.1.3.24 `--werror`, `-Werror`

Added in version 0.14.

Treat warnings from releng-tool as errors.

4.1.4 Variable injection

Added in version 0.12.

Users can override a select set of variables by defining them in the command line arguments. For example, consider a project that defines a `libfoo` package with a version `1.0`:

```
LIBFOO_VERSION = '1.0'
```

If a user wants to override this a run with `1.1`, the following can be used:

```
releng-tool LIBFOO_VERSION=1.1
```

4.2 Configuration

A releng-tool project defines its configuration options inside the a `releng-tool.rt` file at the root of a project (or other defaults; see alternative extensions). The primary configuration option for a developer to define is `packages`, which is used to hold a list of packages to be processed. For example, a project structure such as follows:

```
└── my-project/
    ├── package/
    │   ├── package-a/
    │   │   └── ...
    │   ├── package-b/
    │   │   └── ...
    │   └── package-c/
    │       └── ...
    └── releng-tool.rt                <----
```

Can have a configuration (`releng-tool.rt`) such as:

```
packages = [
    'package-a',
    'package-b',
    'package-c',
]
```

Packages can be loaded implicitly. If other packages depend on each other, a project may only list a subset of packages in a `packages` configuration. For example, if the above had `package-b` dependent on both `package-a` and `package-c`, then only `package-b` would need to be defined in the main configuration file:

```
packages = [
    'package-b',
]
```

4.2.1 Common options

A series of additional configuration options are available to be defined inside the project's configuration. A list of common configuration options are as follows:

4.2.1.1 `default_internal`

A flag to indicate that projects are implicitly loaded as internal projects. By default, packages not explicitly configured as internal or external are assumed to be external packages.

```
default_internal = True
```

See also internal and external packages.

4.2.1.2 `environment`

Added in version 1.3.

A dictionary to define environment variables to apply to all stages of releng-tool.

```
environment = {
    'MY_ENV_1': 'First example',
```

(continues on next page)

(continued from previous page)

```
    'MY_ENV_2': 'Another example',
}
```

4.2.1.3 `extensions`

A list of extensions to load before processing a releng-tool project. If an extension cannot be loaded, releng-tool will stop with information on why an extension could not be loaded.

```
extensions = [
    'ext-a',
    'ext-b',
]
```

See also extensions.

4.2.1.4 `external_packages`

A list of external package locations. By default, packages for a project will be searched for in root directory's package folder (`<root>/package`). In some build environments, some packages may be required or may be preferred to be located in another location/repository. To allow packages to be loaded from another package container directory, one or more package locations can be provided. For example:

```
external_packages = [
    releng_env('MY_EXTERNAL_PKG_DIR'),
]
```

4.2.1.5 `license_header`

As the releng-tool build process is finalized, a license document can be generated containing each package's license information. If a developer wishes to add a custom header to the generated document, a header can be defined by project's configuration. For example:

```
license_header = 'my leading content'
```

See also licenses.

4.2.1.6 `packages`

A list of packages to process. Packages listed will be processed by releng-tool till their completion. Package dependencies not explicitly listed will be automatically loaded and processed as well.

```
packages = [
    'package-a',
    'package-b',
    'package-c',
]
```

The order of listed packages is used to determine the order of processed packages (outside of ordered dictated by `LIBFOO_NEEDS` configurations).

4.2.1.7 `prerequisites`

Added in version 0.6.

A list of host tools to check for before running a releng-tool project. Allows a developer to identify tools to check and fail-fast if missing, instead of waiting for a stage which requires a specific tool and failing later during a building, packaging, etc. phase.

```
prerequisites = [
    'tool-a',
    'tool-b',
    'tool-c',
]
```

4.2.1.8 `revisions`

> **Note**
>
> Users are encouraged to use `LIBFOO_VERSION` or `LIBFOO_REVISION` over this option.

Added in version 2.8.

Provides a dictionary that defines which revisions to use for packages. While package revisions are typically set using `LIBFOO_VERSION` or `LIBFOO_REVISION`, using the project configuration's `revisions` can provide a convenience factor when revisions want to be maintained in a single location.

```
revisions = {
    'libfoo': 'libfoo-v2.1',
    'myapp': '1.0.0',
}
```

The dictionary will map a package name to a revision value. If an entry exists for a package, its provided revision value will be used as if `LIBFOO_REVISION` was configured with this same value.

Also consider:

- A package definition's revision value (i.e. `LIBFOO_VERSION` or `LIBFOO_REVISION`) takes precedence over revision values defined by this configuration option.
- If this option is used and a revision is not defined for a package, packages will use their standard way to resolving a revision.

4.2.1.9 `sbom_format`

Added in version 0.15.

Changed in version 0.16: Support added for `json-spdx` and `rdp-spdx`.

Changed in version 2.4: `rdp-spdx` renamed to `rdf-spdx`.

Configures the default format to use when generating a software build of materials (SBOM). By default, `text` format SBOMs are generated for a project.

```
sbom_format = 'xml'
```

The following lists the available formats supported:

Type	Value
CSV	`csv`
HTML	`html`
JSON	`json`
JSON (SPDX)	`json-spdx`
RDF (SPDX)	`rdf-spdx`
Text	`text` (default)
XML	`xml`

Multiple formats can be provided. For example:

```
sbom_format = [
    'html',
    'json',
]
```

The `all` value is accepted to generate all supported SBOM variants.

See also `sbom` (action) and `--sbom-format <fmt>` (argument).

4.2.1.10 `sysroot_prefix`

Changed in version 2.8: Support added for path-like values.

Define a custom sysroot prefix to provide to packages during their configuration, build and installation stages. By default, the sysroot prefix is typically set to `/usr`; for Windows, the value is empty.

```
sysroot_prefix = '/usr'
```

See also `LIBFOO_PREFIX` and `PREFIX`.

4.2.1.11 `url_mirror`

Specifies a mirror base site to be used for URL fetch requests. If this option is set, any URL fetch requests will first be tried on the configured mirror before attempting to acquired from the defined site in a package definition.

```
url_mirror = 'ftp://mirror.example.org/data/'
```

The `url_mirror` configuration also accepts the following format options:

- `name`: the name of a package
- `version`: the version of a package

For example:

```
url_mirror = 'ftp://mirror.example.org/cache/{name}/'
```

Where `{name}` will be replaced by the package name being fetched.

4.2.2 Advanced options

A list of more advanced configuration options are as follows:

4.2.2.1 cache_ext

A transform for cache extension interpreting. This is an advanced configuration and is not recommended for use except for special use cases outlined below.

When releng-tool fetches assets from remote sites, the site value can used to determine the resulting filename of a cached asset. For example, downloading an asset from `https://example.org/my-file.tgz`, the locally downloaded file will result in a `.tgz` extension. However, not all defined sites will result in an easily interpreted cache extension. While releng-tool will attempt its best to determine an appropriate extension value to use, some use cases may not be able to be handled. To deal with these cases, a developer can define a transform method to help translate a site value into a known cache extension value.

Consider the following example: a host is used to acquire assets from a content server. The URI to download an asset uses a unique request format `https://static.example.org/fetch/25134`. releng-tool may not be able to find the extension for the fetched asset, but if a developer knows the expected archive types for these calls, a custom transform can be defined. For example:

```
def my_translator(site):
    if 'static.example.org' in site:
        return 'tgz'
    return None

cache_ext = my_translator
```

The above transform indicates that all packages using the `static.example.org` site will be `tgz` archives.

4.2.2.2 default_cmake_build_type

Added in version 2.7.

CMake packages can configure their default build type on individual packages using `LIBFOO_CMAKE_BUILD_TYPE`. However, if a developer wishes to configure the default build type across all CMake packages, this option may be used. For example, to default to using the `Release` build type, the following may be used:

```
default_cmake_build_type = 'Release'
```

See also `LIBFOO_CMAKE_BUILD_TYPE`.

4.2.2.3 default_devmode_ignore_cache

Added in version 2.1.

When operating in development mode, packages may configure `LIBFOO_DEVMODE_IGNORE_CACHE` to indicate that a package should ignore any generated cache when operating from a clean state. If a developer is managing a package set in a project where most (if not all) packages would want to use this feature, a global override can be configured.

```
default_devmode_ignore_cache = True
```

Setting this value to `True` will default all packages to operate with a manner as if `LIBFOO_DEVMODE_IGNORE_CACHE = True`. Individual packages may opt-out in this scenario by configuring `LIBFOO_DEVMODE_IGNORE_CACHE = False`.

See also `LIBFOO_DEVMODE_IGNORE_CACHE`.

4.2.2.4 `default_meson_build_type`

Added in version 2.7.

Meson packages can configure their default build type on individual packages using `LIBFOO_MESON_BUILD_TYPE`. However, if a developer wishes to configure the default build type across all Meson packages, this option may be used. For example, to default to using the `Release` build type, the following may be used:

```
default_meson_build_type = 'release'
```

See also `LIBFOO_MESON_BUILD_TYPE`.

4.2.2.5 `extra_license_exceptions`

Added in version 0.14.

A dictionary to define extra license exceptions that are permitted in package definitions. Packages which define license exceptions in a `LIBFOO_LICENSE` option are expected to use SPDX License Exceptions. If not, a warning is generated by default. A project can define their own custom exceptions by adding them into a project's `extra_license_exceptions` option to avoid this warning:

```
extra_license_exceptions = {
    'My-Exception-ID': 'Exception Name',
}
```

See also licenses.

4.2.2.6 `extra_licenses`

Added in version 0.14.

A dictionary to define extra licenses that are permitted in package definitions. Packages which define licenses in a `LIBFOO_LICENSE` option are expected to use a licensed defined in the SPDX License List. If not, a warning is generated by default. A project can define their own custom license by adding them into a project's `extra_licenses` option to avoid this warning:

```
extra_licenses = {
    'My-License-ID': 'License Name',
}
```

See also licenses.

4.2.2.7 `override_extract_tools`

A dictionary to be provided to map an extension type to an external tool to indicate which tool should be used for extraction. For example, when a `.zip` archive is being processed for extraction, releng-tool will internally extract the archive. However, a user may wish to override this tool with their own extraction utility. Consider the following example:

```
override_extract_tools = {
    'zip': '/opt/my-custom-unzip {file} {dir}',
}
```

The `{file}` key will be replaced with the file to be extracted, and the `{dir}` key will be replaced where the contents should extract to.

4.2.2.8 `quirks`

A list of configuration quirks to apply to deal with corner cases which can prevent releng-tool operating on a host system.

```
quirks = [
    'releng.<special-quirk-id>',
]
```

For a list of available quirks, see quirks.

4.2.2.9 `urlopen_context`

Added in version 0.10.

Allows a project to specify a custom SSL context[1] to apply for URL fetch requests. This can be useful for environments which may experience `CERTIFICATE_VERIFY_FAILED` errors when attempting to fetch files. A custom SSL context can be created and tailored for a build environment. For example:

```
import ssl
...

urlopen_context = ssl.create_default_context()
```

4.2.2.10 `vsdevcmd`

> **Note**
>
> The option is ignored in non-Windows environments.

Added in version 1.4.

Changed in version 2.5: Cycles through all applicable configured products until the first install that provides `VsDevCmd.bat` is found.

Allows a project to automatically load Visual Studio Developer Command Prompt (`VsDevCmd.bat`) variables into the releng-tool process. This will allow packages and post-build scripts to invoke commands as if releng-tool was started from within a Visual Studio Developer Command Prompt.

```
vsdevcmd = True
```

The version of which Visual Studio application it used is determined with the help of Visual Studio Locator (vswhere). By default, the newest version of Visual Studio and the most recent installed version is used (assuming the installation includes a `VsDevCmd.bat` script).

Projects looking to use an explicit version of Visual Studio can specify a version string that is compatible with Visual Studio Locator's `-version` argument.

```
vsdevcmd = '[17.0,18.0)'
```

See also `vsdevcmd_products` and `LIBFOO_VSDEVCMD`.

[1] https://docs.python.org/library/urllib.request.html#urllib.request.urlopen

4.2.2.11 `vsdevcmd_products`

> **Note**
>
> The option is ignored in non-Windows environments.

Added in version 2.4.

Allows a project to configure which products to search for when releng-tool invokes Visual Studio Locator to find which Visual Studio tooling to use. By default, releng-tool operates as if `vswhere` is invoked with the `-products *` argument. Providing a string in this option replaces the asterisk value with the configured value.

```
vsdevcmd_products = 'Microsoft.VisualStudio.Product.BuildTools'
```

See also `vsdevcmd` and `LIBFOO_VSDEVCMD_PRODUCTS`.

4.2.3 Deprecated options

The following outlines deprecated configuration options. It is not recommended to use these options.

4.2.3.1 `override_revisions`

Deprecated since version 2.0: The use of revision overrides is deprecated. Users wanting to override revisions without source modification are recommended to use variable injection.

> **Warning**
>
> The use of an override option should only be used in special cases (see also configuration overrides).

Allows a dictionary to be provided to map a package name to a new revision value. Consider the following example: a project defines `module-a` and `module-b` packages with package `module-b` depending on package `module-a`. A developer may be attempting to tweak package `module-b` on the fly to test a new capabilities against the current stable version of `module-a`. However, the developer does not want to explicitly change the revision inside package `module-b`'s definition. To avoid this, an override can be used instead:

```
override_revisions = {
    'module-b': '<test-branch>',
}
```

The above example shows that package `module-b` will fetch using a test branch instead of what is defined in the actual package definition.

4.2.3.2 `override_sites`

Deprecated since version 2.0: The use of site overrides is deprecated. Users wanting to override sites without source modification are recommended to use variable injection.

> **Warning**
>
> The use of an override option should only be used in special cases (see also configuration overrides).

A dictionary to be provided to map a package name to a new site value. There may be times where a host may not have access to a specific package site. To have a host to use a mirror location without having to adjust the package definition, the site override option can be used. For example, consider a package pulls from site `git@example.com:myproject.git`. However, the host `example.com` cannot be access from the host machine. If a mirror location has been setup at `git@example.org:myproject.git`, the following override can be used:

```
override_sites = {
    '<pkg>': 'git@example.org:mywork.git',
}
```

4.3 Environment variables

Variables outlined below are available in both the environment and in applicable script contexts (unless noted otherwise). For example, the `RELENG_VERSION` variable can be accessed by invoked programs such as a Makefile definition:

```
all:
        @echo Using version ${RELENG_VERSION}
```

Or an invoked shell script:

```
echo "Using version $RELENG_VERSION"
```

For package definitions and releng-tool scripts, these variables can be directly used:

```
print(f'Using version {RELENG_VERSION}')
```

> **Tip**
>
> Avoid using external environment variables for a project to configure package options such as compiler flags or interpreters. Managing these options inside a releng-tool project configuration or package definitions can improve configuration management.

4.3.1 Common

When configuration, package definitions or various scripts are invoked by releng-tool, the following environment variables are available:

4.3.1.1 BUILD_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The build directory for a project. By default, this will be a folder `build` found inside the configured output directory. For example:

```
<root-dir>/output/build
```

For package-specific build directories, see `PKG_BUILD_DIR`.

4.3.1.2 CACHE_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The cache directory which holds distributed version control cache data (e.g. Git data). By default, this will be a folder `cache` found inside the configured root directory. For example:

```
<root-dir>/cache
```

See also `RELENG_CACHE_DIR` and the `--cache-dir` argument.

4.3.1.3 DL_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The download directory which holds a local copy of package artifacts. By default, this will be a folder `dl` found inside the configured root directory. For example:

```
<root-dir>/dl
```

See also `RELENG_DL_DIR` and the `--dl-dir` argument.

4.3.1.4 HOST_BIN_DIR

Added in version 0.14.

Changed in version 2.2: Variable is path-like in a script environment.

The host directory's prefixed bin directory. For example:

```
<root-dir>/output/host/usr/bin
```

4.3.1.5 HOST_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The host directory. By default, this will be a folder `host` found inside the configured output directory. For example:

```
<root-dir>/output/host
```

4.3.1.6 HOST_INCLUDE_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The host directory's prefixed include directory. An example include directory may be as follows:

```
<root-dir>/output/host/usr/include
```

4.3.1.7 HOST_LIB_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The host directory's prefixed library directory. An example library directory may be as follows:

```
<root-dir>/output/host/usr/lib
```

4.3.1.8 HOST_SHARE_DIR

Added in version 2.1.

Changed in version 2.2: Variable is path-like in a script environment.

The host directory's prefixed share directory. An example share directory may be as follows:

```
<root-dir>/output/host/usr/share
```

4.3.1.9 IMAGES_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The images directory which holds final images/packages from a run. By default, this will be a folder `images` found inside the configured output directory. For example:

```
<root-dir>/output/images
```

See also `RELENG_IMAGES_DIR` and the `--images-dir` argument.

4.3.1.10 LICENSE_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The licenses directory which holds tracked license information from a run. By default, this will be a folder `licenses` found inside the configured output directory. For example:

```
<root-dir>/output/licenses
```

See also licenses.

4.3.1.11 NJOBS

Number of calculated jobs to allow at a given time. Unless explicitly set by a system builder on the command line, the calculated number of jobs should be equal to the number of physical cores on the host. When building a specific package and the package overrides the number of jobs to use, the package-defined count will be used instead. This configuration will always be a value of at least one (`1`).

4.3.1.12 NJOBSCONF

Number of jobs to allow at a given time. Unlike `NJOBS`, `NJOBSCONF` provides the requested configured number of jobs to use. The value may be set to zero (`0`) to indicate an automatic detection of jobs to use. This can be useful for tools which have their own automatic job count implementation and do not want to rely on the value defined by `NJOBS`. When building a specific package and the package overrides the number of jobs to use, the package-defined count will be used instead.

4.3.1.13 OUTPUT_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The output directory. By default, this will be a folder `output` found inside the configured root directory. For example:

```
<root-dir>/output
```

The output directory can be configured using either:

- The `--out-dir` argument.
- The `RELENG_OUTPUT_DIR` environment variable.
- The `RELENG_GLOBAL_OUTPUT_CONTAINER_DIR` environment variable.

4.3.1.14 PKG_BUILD_BASE_DIR

Added in version 0.12.

The directory for a specific package's base directory for buildable content. In most cases, this value will be the same as `PKG_BUILD_DIR`. However, if `LIBFOO_BUILD_SUBDIR` is configured, `PKG_BUILD_DIR` will also include the configured sub-directory. The value of `LIBFOO_BUILD_SUBDIR` does not adjust the value of `PKG_BUILD_BASE_DIR`.

For example, for a package `test`, the package build base directory may be:

```
<root>/build/test-1.0
```

See also `PKG_BUILD_DIR`.

4.3.1.15 PKG_BUILD_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The directory for a specific package's buildable content. This path is the working directory for package stages (e.g. configuration, build, etc.).

```
<root>/build/<pkg-name>[-<pkg-version>]
```

For example, for a package `test` with a version set (e.g. `PKG_VERSION='1.0'`), the package build directory may be:

```
<root>/build/test-1.0
```

If `PKG_VERSION` is not configure, the package build directory may be:

```
<root>/build/test
```

If `LIBFOO_BUILD_SUBDIR` is configured, the sub-directory path will be appended. For example:

```
# LIBFOO_BUILD_SUBDIR='subdir/subdir2'
<root>/build/test/subdir/subdir2
```

See also `PKG_BUILD_BASE_DIR` and `PKG_BUILD_OUTPUT_DIR`.

4.3.1.16 PKG_BUILD_OUTPUT_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The directory for where a package's build output will be stored.

For example, for a package `test`, the package build output directory may be:

```
<root>/build/test-1.0/releng-output
```

See also `PKG_BUILD_DIR`.

4.3.1.17 PKG_CACHE_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The location of the cache directory for a package. If a package defines a fetch from a repository which can be locally cached, this cache directory represents the location where the local cache of content will be held. For example, if a provide defines a Git-based site, a local cache of the Git repository will be stored in this location. Typically, packages should not need to operate on the cache directory except for advanced cases.

For example, for a package `test`, the package cache directory would be:

```
<root>/cache/test
```

4.3.1.18 PKG_CACHE_FILE

Changed in version 2.2: Variable is path-like in a script environment.

The location of the cache file for a package. If a package defines a fetch of an archive from a remote source, after the fetch stage is completed, the archive can be found in this location.

For example, if a package defines a site `https://www.example.com/test.tgz`, the resulting cache file may be:

```
<root>/output/dl/test-1.0.tgz
```

4.3.1.19 PKG_DEFDIR

Changed in version 2.2: Variable is path-like in a script environment.

The package's definition directory.

For example, for a package `test`, the definition directory would be:

```
<root>/package/test
```

4.3.1.20 PKG_DEVMODE

Added in version 0.13.

Whether the package is configured for development mode. While runtime may be configured in a development mode, not all packages may be designed for development (e.g. external packages). If both a package is aimed for internal development and the runtime is configured in a development mode, the environment variable will be set to a value of one (i.e. `PKG_DEVMODE=1`).

See also `RELENG_DEVMODE` and development mode.

4.3.1.21 PKG_INTERNAL

Whether or not the package is considered "internal". If internal, the environment variable will be set to a value of one (i.e. `PKG_INTERNAL=1`).

See also internal and external packages.

4.3.1.22 PKG_LOCALSRCS

Added in version 0.13.

Whether the package is configured for local-sources mode. If a package is configured for local-sources, the environment variable will be set to a value of one (i.e. `PKG_LOCALSRCS=1`).

See also local-sources mode.

4.3.1.23 PKG_NAME

The name of the package.

4.3.1.24 PKG_REVISION

The site revision of the package.

See also `LIBFOO_REVISION`.

4.3.1.25 PKG_SITE

The site of the package.

See also LIBFOO_SITE.

4.3.1.26 PKG_VERSION

The version of the package.

See also LIBFOO_VERSION.

4.3.1.27 PREFIX

The sysroot prefix for the package. By default, this value is configured to /usr; with the exception of Windows builds where this value is empty by default.

See also LIBFOO_PREFIX and sysroot_prefix.

4.3.1.28 PREFIXED_HOST_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The host directory with the prefix applied. An example prefixed directory may be as follows:

```
<root-dir>/output/host/usr
```

4.3.1.29 PREFIXED_STAGING_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory with the prefix applied. An example prefixed directory may be as follows:

```
<root-dir>/output/staging/usr
```

4.3.1.30 PREFIXED_TARGET_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory with the prefix applied. An example prefixed directory may be as follows:

```
<root-dir>/output/target/usr
```

4.3.1.31 RELENG_CLEAN

Added in version 0.7.

Flag set if performing a clean request.

This includes when a user invokes either a clean, distclean or mrproper action request.

4.3.1.32 RELENG_DEBUG

Added in version 0.7.

Flag set if debug-related information should be shown.

This flag is enabled when the `--debug` argument is configured.

4.3.1.33 RELENG_DEVMODE

Added in version 0.2.

The development mode or flag set if in development mode.

See also `PKG_DEVMODE` and `--development`.

4.3.1.34 RELENG_DISTCLEAN

Added in version 0.7.

Flag set if performing an extreme pristine clean request.

This includes when a user invokes either the `distclean` action request.

4.3.1.35 RELENG_EXEC

Added in version 1.4.

Flag set if performing a `<pkg>-exec` request.

4.3.1.36 RELENG_FORCE

Added in version 0.11.

Flag set if performing a forced request from the command line.

See also `--force`.

4.3.1.37 RELENG_LOCALSRCS

Added in version 0.2.

Flag set if in local-sources mode.

See also `--local-sources`.

4.3.1.38 RELENG_MRPROPER

Flag set if performing a pristine clean request.

This includes when a user invokes either a `distclean` or `mrproper` action request.

4.3.1.39 RELENG_PROFILES

Added in version 2.5.

Defines one or more semicolon-separated profile values actively configured for a run.

See also `--profile` and using profiles.

4.3.1.40 RELENG_REBUILD

Flag set if performing a re-build request.

See also `<pkg>-rebuild` and `<pkg>-rebuild-only`.

4.3.1.41 RELENG_RECONFIGURE

Flag set if performing a re-configuration request.

See also `<pkg>-reconfigure` and `<pkg>-reconfigure-only`.

4.3.1.42 RELENG_REINSTALL

Flag set if performing a re-install request.

See also `<pkg>-reinstall`.

4.3.1.43 RELENG_SCRIPT

Added in version 1.0.

Changed in version 2.2: Variable is path-like in a script environment.

The path of the script currently being executed.

See also `RELENG_SCRIPT_DIR`.

4.3.1.44 RELENG_SCRIPT_DIR

Added in version 1.0.

Changed in version 2.2: Variable is path-like in a script environment.

The path of the directory holding the script currently being executed.

See also `RELENG_SCRIPT`.

4.3.1.45 RELENG_TARGET_PKG

Added in version 0.13.

The name of the target package (if any) provided by the command line.

For example, if running `libfoo-rebuild`, the target package would be:

```
libfoo
```

See also package actions.

4.3.1.46 RELENG_VERBOSE

Added in version 0.7.

Flag set if verbose-related information should be shown.

This flag is enabled when the `--verbose` argument is configured.

4.3.1.47 RELENG_VERSION

Added in version 0.7.

The version of releng-tool.

4.3.1.48 ROOT_DIR

Changed in version 2.2: Variable is path-like in a script environment.

Directory to process a releng-tool project.

The root directory can be configured using the `--root-dir` argument.

4.3.1.49 STAGING_BIN_DIR

Added in version 0.14.

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory's prefixed bin directory. An example binary directory may be as follows:

```
<root-dir>/output/staging/usr/bin
```

4.3.1.50 STAGING_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory. By default, this will be a folder `staging` found inside the configured output directory. For example:

```
<root-dir>/output/staging
```

4.3.1.51 STAGING_INCLUDE_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory's prefixed include directory. An example include directory may be as follows:

```
<root-dir>/output/staging/usr/include
```

4.3.1.52 STAGING_LIB_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory's prefixed library directory. An example library directory may be as follows:

```
<root-dir>/output/staging/usr/lib
```

4.3.1.53 STAGING_SHARE_DIR

Added in version 2.1.

Changed in version 2.2: Variable is path-like in a script environment.

The staging area directory's prefixed share directory. An example share directory may be as follows:

```
<root-dir>/output/staging/usr/share
```

4.3.1.54 SYMBOLS_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The symbols area directory. By default, this will be a folder `symbols` found inside the configured output directory. For example:

```
<root-dir>/output/symbols
```

4.3.1.55 TARGET_BIN_DIR

Added in version 0.14.

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory's prefixed bin directory. An example binary directory may be as follows:

```
<root-dir>/output/target/usr/bin
```

4.3.1.56 TARGET_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory. By default, this will be a folder `target` found inside the configured output directory. For example:

```
<root-dir>/output/target
```

4.3.1.57 TARGET_INCLUDE_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory's prefixed include directory. An example include directory may be as follows:

```
<root-dir>/output/target/usr/include
```

4.3.1.58 TARGET_LIB_DIR

Added in version 0.12.

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory's prefixed library directory. An example library directory may be as follows:

```
<root-dir>/output/target/usr/lib
```

4.3.1.59 TARGET_SHARE_DIR

Added in version 2.1.

Changed in version 2.2: Variable is path-like in a script environment.

The target area directory's prefixed share directory. An example share directory may be as follows:

```
<root-dir>/output/target/usr/share
```

4.3.2 Package-specific variables

Package-specific environment variables are also available if another package or script needs to rely on the (generated) configuration of another package. For example, if a package `LIBFOO` existed with a package definition:

```
LIBFOO_VERSION = '1.0.0'
```

The environment variable `LIBFOO_VERSION` with a value of `1.0.0` can be used in other configurations and script files. The following package-specific environment variables are available for use, where `<PKG>` translates to a releng-tool's determined package key:

4.3.2.1 `<PKG>_BUILD_DIR`

Changed in version 2.2: Variable is path-like in a script environment.

The directory for a defined package's buildable content.

For most packages, this path will match the value specified in `<PKG>_BUILD_OUTPUT_DIR`. For package types that do not support in-tree building (e.g. CMake), this path may be the parent of the value specified in `<PKG>_BUILD_OUTPUT_DIR`:

```
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo-1.0.0          <---- LIBFOO_BUILD_DIR
    │           └── releng-output     <---- LIBFOO_BUILD_OUTPUT_DIR
    │               └── ...
    ├── package/
    │   └── libfoo/
    │       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

For cases where a package uses local sources, this path may change to point to the specified local source path. For example, when configured for local-sources mode, the build directory may exist out of the root directory:

```
├── libfoo/                           <---- LIBFOO_BUILD_DIR
│   └── ...
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo-1.0.0          <---- LIBFOO_BUILD_OUTPUT_DIR
    │           └── ...
    ├── package/
    │   └── libfoo/
    │       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

Or, when using a `local` VCS type, the path may be set for a folder inside the package's definition directory:

```
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo-1.0.0          <---- LIBFOO_BUILD_OUTPUT_DIR
    │           └── ...
    ├── package/
    │   └── libfoo/
    │       ├── local/                <---- LIBFOO_BUILD_DIR
    │       │   └── ...
    │       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

4.3.2.2 <PKG>_BUILD_OUTPUT_DIR

Changed in version 2.2: Variable is path-like in a script environment.

The directory for where a defined package's build output will be stored.

This location is a path is a folder inside the project's `output/build` directory. The name is typically a combination of the package's name and version (e.g. `libfoo-1.0.0`):

```
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo-1.0.0          <---- LIBFOO_BUILD_OUTPUT_DIR
    │           └── ...
    ├── package/
    │   └── libfoo/
    │       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

However, if no version is specified for a package, the folder name may just be `libfoo`:

```
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo                <---- LIBFOO_BUILD_OUTPUT_DIR
    │           └── ...
    ├── package/
    │   └── libfoo/
    │       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

Note for some package types, the build output directory may be changed to have an additional path (e.g. `output/build/libfoo-1.0.0/releng-output`) for package types like CMake. For example:

```
└── my-releng-tool-project/
    ├── output/
    │   └── build/
    │       └── libfoo-1.0.0
    │           └── releng-output     <---- LIBFOO_BUILD_OUTPUT_DIR
```

(continues on next page)

(continued from previous page)

```
    |               └── ...
    ├── package/
    |   └── libfoo/
    |       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

4.3.2.3 <PKG>_DEFDIR

Changed in version 2.2: Variable is path-like in a script environment.

The directory where a defined package's definition is stored.

For example, if a package `libfoo` exists, the `LIBFOO_DEFDIR` environment variable will contain a directory path matching the path seen below:

```
└── my-releng-tool-project/
    ├── package/
    |   └── libfoo/                    <---- LIBFOO_DEFDIR
    |       └── libfoo.rt
    ├── releng-tool.rt
    ...
```

4.3.2.4 <PKG>_NAME

The name of the package.

For example, if a package `libfoo` exists, the `LIBFOO_NAME` environment variable will have a value of `libfoo`.

4.3.2.5 <PKG>_REVISION

The revision of a defined package. If a package does not define a revision, the value used will match the version value (if set). If no version value exists, this variable may be empty.

4.3.2.6 <PKG>_VERSION

The version of a defined package. If a package does not define a version, the value used will match the revision value (if set). If no revision value exists, this variable may be empty.

4.3.3 Script-only variables

A series a script-only variables are also available at certain stages of releng-tool.

4.3.3.1 RELENG_GENERATED_LICENSES

Added in version 1.3.

Defines a list of generated license files at the end of package processing that is available for post-processing actions to use.

4.3.3.2 RELENG_GENERATED_SBOMS

Added in version 1.3.

Defines a list of generated software build of materials (SBOM) files at the end of package processing that is available for post-processing actions to use.

4.3.4 Other variables

releng-tool also accepts environment variables for configuring specific features of the releng-tool process. The following environment variables are accepted:

4.3.4.1 RELENG_ASSETS_DIR=<dir>

Added in version 0.10.

Configures the asset directory to use. The asset directory is the container directory to use for both cache and download content. By default, no asset directory is configured. If a user does not override an asset directory using the `--assets-dir` argument, the `RELENG_ASSETS_DIR` can be used as the container directory override for both cache and download content.

4.3.4.2 RELENG_CACHE_DIR=<dir>

Added in version 0.10.

Configures the cache directory to use. By default, the cache directory used is configured to `<root>/cache`. If a user does not override a cache directory using the `--cache-dir` argument, the `RELENG_CACHE_DIR` option can be used to override this location.

See also `CACHE_DIR`.

4.3.4.3 RELENG_DL_DIR=<dir>

Added in version 0.10.

Configures the download directory to use. By default, the download directory used is configured to `<root>/dl`. If a user does not override a download directory using the `--dl-dir` argument, the `RELENG_DL_DIR` option can be used to override this location.

See also `DL_DIR`.

4.3.4.4 RELENG_GLOBAL_OUTPUT_CONTAINER_DIR=<dir>

> **Note**
>
> This environment variable is always ignored when either the `--out-dir` argument or `RELENG_OUTPUT_DIR` environment variable is used.

Added in version 1.1.

Configures a "global" container directory used to hold the output contents of releng-tool projects. Projects will typically generate output contents inside a project's `<root-dir>/output` directory. This can be overridden using the `--out-dir` argument or `RELENG_OUTPUT_DIR` environment variable, if a user wishes to generate a build on a different path/partition. While these overrides can help, users managing multiple releng-tool projects will need to tailor a specific output directory value for each project they wish to build. This may be less than ideal if projects typically build in an output folder in a common directory. To help avoid this, this environment variable can be used.

When configuring this option, the default output folder for projects will be set to the provided container directory along with a project's root directory name:

```
$RELENG_GLOBAL_OUTPUT_CONTAINER_DIR/<root-directory-name>
```

This allows a user to build multiple releng-tool projects with output data placed inside a common directory path without needing to explicitly configure a specific output directory each project's build.

For example, if a user stores multiple projects inside a `~/projects/` path and configures this option to the path `/mnt/extern-disk`:

```
export RELENG_GLOBAL_OUTPUT_CONTAINER_DIR=/mnt/extern-disk
```

The following folder structure should be expected:

```
├── usr/
│   └── home/
│       └── myuser/
│           └── projects/
│               ├── my-project-a/
│               │   ├── ...
│               │   └── releng-tool.rt
│               └── my-project-b/
│                   ├── ...
│                   └── releng-tool.rt
└── mnt/
    └── extern-disk/
        ├── my-project-a/
        │   └── ...
        └── my-project-b/
            └── ...
```

4.3.4.5 RELENG_IGNORE_RUNNING_AS_ROOT=1

Added in version 0.10.

Suppress the warning generated when running releng-tool with an elevated user.

4.3.4.6 RELENG_IGNORE_UNKNOWN_ARGS=1

Added in version 1.3.

Suppress the warning/error generated when running releng-tool with unknown arguments.

See also the `--relaxed-args` argument.

4.3.4.7 RELENG_IMAGES_DIR=<dir>

Added in version 0.13.

Configures the images directory to use. By default, the images directory used is configured to `<root>/output/images`. If a user does not override a images directory using the `--images-dir` argument, the `RELENG_IMAGES_DIR` option can be used to override this location.

See also `IMAGES_DIR`.

4.3.4.8 RELENG_OUTPUT_DIR=<dir>

Added in version 1.1.

Configures the output directory to use. By default, the output directory used is configured to `<root>/output`. If a user does not override an output directory using the `--out-dir` argument, the `RELENG_OUTPUT_DIR` option can be used to override this location.

See also `RELENG_GLOBAL_OUTPUT_CONTAINER_DIR`.

4.3.4.9 `RELENG_PARALLEL_LEVEL=<level>`

Added in version 2.3.

Changed in version 2.9: Added support for negative jobs.

Configures the number of jobs to use (defaults to `0`; automatic).

If the total number of jobs provided is negative, it will subtract the provided value from the automatic job detection count (to a minimum of one).

See also the `--jobs` argument, `NJOBS` and `NJOBSCONF`.

4.3.4.10 Tool overrides

Environment variables can be used to help override external tool invoked by the releng-tool process. For example, when invoking CMake-based projects, the tool `cmake` will be invoked. However, if a builder is running on CentOS and CMake v3.x is desired, the tool `cmake3` needs to be invoked instead. To configure this, an environment variable can be set to switch which tool to invoke. Consider the following example:

```
$ export RELENG_CMAKE=cmake3
$ releng-tool
[cmake3 will be used for cmake projects]
```

4.4 Packages

Packages for a project are defined inside the `package/` directory. Packages can consist of libraries, programs or even basic assets.

```
└── sample-releng-tool-project/
    ├── package/
    │   ├── box-firmware/
    │   │   ├── box-firmware.rt
    │   │   └── box-firmware.hash
    │   ├── libfw-uploader/
    │   │   └── libfw-uploader.rt
    │   ├── libsupport/
    │   │   └── libsupport.rt
    │   └── rack-engine/
    │       └── rack-engine.rt
    └── releng-tool.rt
```

Overview

There is no explicit limit on the total number of packages a project can have. Package names are recommended to be lower-case with dash-separated (`-`) separators (if needed). For example, `package-a` is recommended over `PackageA` or `package_a`; however, the choice is up to the developer making the releng-tool project.

When making a package, a container folder for the package as well as a package definition file needs to be made. For example, for a package `package-a`, the file `package/package-a/package-a.rt` should exist.

```
└── my-releng-tool-project/
    ├── package/
    │   └── package-a/                <---- Container
    │       └── package-a.rt          <---- Definition
    ...
```

Package definition files are Python-based. Inside the definition file, a series of configuration options can be set to tell releng-tool how to work with the defined package. Each option is prefixed with a variable-safe variant of the package name. The prefix value will be an uppercase string based on the package name with special characters converted to underscores. For example:

- `package-a` will have a prefix `PACKAGE_A_`
- `libfoo` will have a prefix `LIBFOO_`
- `MyAwesomeModule` will have a prefix `MYAWESOMEMODULE_`

For a package to take advantage of a configuration option, the package definition will add a variable entry with the package's prefix followed by the supported option name. Considering the same package with the name `package-a` which has a prefix `PACKAGE_A_`; to use the `LIBFOO_VERSION` configuration option, the option `PACKAGE_A_VERSION` should be defined:

```
PACKAGE_A_VERSION = '1.0.0'
```

Topics

4.4.1 Common package options

The following outlines common configuration options available for packages.

4.4.1.1 LIBFOO_INSTALL_TYPE

Defines the installation type of this package. A package may be designed to be built and installed for just the target area, the stage area, both or maybe in the host directory. The following options are available for the installation type:

Type	Description
`host`	The host directory.
`images`	The images directory.
`staging`	The staging area.
`staging_and_target`	Both the staging an target area.
`target`	The target area.

The default installation type is `target`.

```
LIBFOO_INSTALL_TYPE = 'target'
```

See also `LIBFOO_HOST_PROVIDES`.

4.4.1.2 LIBFOO_LICENSE

A string or list of strings outlining the license information for a package. Outlining the license of a package is recommended. It is recommended to use SPDX registered licenses.

```
LIBFOO_LICENSE = [
    'GPL-2.0-only',
    'MIT',
]
```

or

```
LIBFOO_LICENSE = 'GPL-2.0-or-later WITH Bison-exception-2.2'
```

or

```
LIBFOO_LICENSE = 'LicenseRef-MyCompanyLicense'
```

See also `LIBFOO_LICENSE_FILES`.

4.4.1.3 LIBFOO_LICENSE_FILES

A string or list of strings identifying the license files found inside the package sources which typically would match up to the defined `LICENSE` entries (respectively).

```
LIBFOO_LICENSE_FILES = [
    'LICENSE.GPLv2',
    'LICENSE.MIT',
]
```

or

```
LIBFOO_LICENSE_FILES = 'LICENSE'
```

See also `LIBFOO_LICENSE`.

4.4.1.4 LIBFOO_NEEDS

> **Note**
>
> The option replaces the legacy `LIBFOO_DEPENDENCIES` option.

Added in version 1.3.

List of package dependencies a given project has. If a project depends on another package, the package name should be listed in this option. This ensures releng-tool will process packages in the proper order. The following shows an example package `libfoo` being dependent on `liba` and `libb` being processed first:

```
LIBFOO_NEEDS = [
    'liba',
    'libb',
]
```

See also `LIBFOO_PREEXTRACT`.

4.4.1.5 LIBFOO_SITE

The site where package sources/assets can be found. The site can be a URL of an archive, or describe a source control URL such as Git or SVN. The following outline a series of supported site definitions:

Changed in version 0.10: Support added for `rsync+`.

Changed in version 0.17: Support added for `perforce+`.

Changed in version 1.4: Support added for `brz+`.

Changed in version 2.0: Support added for `file+`.

Deprecated since version 2.0: Support for Bazaar sites is deprecated.

Type	Prefix/Postfix
Breezy	`brz+`
Bazaar	`bzr+` *(deprecated)*
CVS	`cvs+`
File	`file+` or `file://`
Git	`git+` or `.git`
Mercurial	`hg+`
Perforce	`perforce+`
rsync	`rsync+`
SCP	`scp+`
SVN	`svn+`
URL	`(wildcard)`

Examples include:

```
LIBFOO_SITE = 'https://example.com/libfoo.git'
LIBFOO_SITE = 'cvs+:pserver:anonymous@cvs.example.com:/var/lib/cvsroot mymodule'
LIBFOO_SITE = 'svn+https://svn.example.com/repos/libfoo/c/branches/libfoo-1.2'
LIBFOO_SITE = 'https://www.example.com/files/libfoo.tar.gz'
LIBFOO_SITE = {
```

(continues on next page)

(continued from previous page)

```
    DEFAULT_SITE: 'https://pkgs.example.com/releases/libfoo-${LIBFOO_VERSION}.tar.gz',
    '<mode>': 'https://git.example.com/libfoo.git',
}
```

A developer can also use `LIBFOO_VCS_TYPE` to explicitly define the version control system type without the need for a prefix hint. The use of a dictionary value is only useful when operating in development mode.

Using a specific type will create a dependency for a project that the respective host tool is installed on the host system. For example, if a Git site is set, the host system will need to have `git` installed on the system.

If no site is defined for a package, it will be considered a virtual package (i.e. has no content). If applicable, loaded extensions may provide support for custom site protocols.

Specifying a local site value with `local` will automatically configure a VCS-type of `local`.

See also `LIBFOO_VCS_TYPE` and site definitions.

4.4.1.6 LIBFOO_TYPE

Changed in version 0.13: Support added for `make`.

Changed in version 0.16: Support added for `meson`.

Changed in version 1.3: Support added for `cargo`.

Changed in version 2.8: Support added for `waf`.

The package type. The default package type is a (Python) script-based package. releng-tool also provides a series of helper package types for common frameworks. The following outline a series of supported type definitions:

Type	Value
Autotools	`autotools`
Cargo	`cargo`
CMake	`cmake`
Make	`make`
Meson	`meson`
Python	`python`
SCons	`scons`
Script	`script`
Waf	`waf`

For example:

```
LIBFOO_TYPE = 'script'
```

If no type is defined for a package, it will be considered a script-based package. If applicable, loaded extensions may provide support for custom types.

Using a specific type will create a dependency for a project that the respective host tool is installed on the host system. For example, if a CMake type is set, the host system will need to have `cmake` installed on the system.

4.4.1.7 LIBFOO_VERSION

The version of the package. Typically the version value should be formatted in a semantic versioning style, but it is up to the developer to decide the best version value to use for a package. It is important to note that the version value is used to determine build output folder names, cache files and more.

```
LIBFOO_VERSION = '1.0.0'
```

For some VCS types, the version value will be used to acquire a specific revision of sources. If for some case the desired version value cannot be gracefully defined (e.g. a version value `libfoo-v1.0` will produce output directories such as `libfoo-libfoo-v1.0`), `LIBFOO_REVISION` can be used.

See also `LIBFOO_DEVMODE_REVISION` and `LIBFOO_REVISION`.

4.4.2 Advanced package options

The following outlines more advanced configuration options available for packages.

4.4.2.1 LIBFOO_BUILD_SUBDIR

Changed in version 2.2: Support added for path-like values.

Sub-directory where a package's extracted sources holds its buildable content. Sources for a package may be nested inside one or more directories. A package can specify the sub-directory where the configuration, build and installation processes are invoked from.

```
LIBFOO_BUILD_SUBDIR = 'subdir'
```

4.4.2.2 LIBFOO_DEVMODE_IGNORE_CACHE

Added in version 0.3.

Flag value to indicate that a package should ignore any generated cache file when operating in development mode. In most cases, users want to take advantage of cached sources to prevent having to re-fetch the same content again between builds. However, some packages may be configured in a way where their request for a package's contents varies from a fresh stage. For example, when pulling from a branch, releng-tool will not attempt to re-fetch from a site since a cached content has already been fetched. If a developer configures a package to use a revision value with dynamic content, they may wish to use this option to have a user always force fetching new content from a clean state.

```
LIBFOO_DEVMODE_IGNORE_CACHE = True
```

By default, this option is not defined and results can vary based off the site type being fetched. In most cases, fetch operations will treat the default case of this option as disabled (`False`). DVCS site types may elect to enable this option by default (`True`) if the target revision is a branch.

See also `default_devmode_ignore_cache`.

4.4.2.3 LIBFOO_DEVMODE_PATCHES

Added in version 2.9.

Allow configuring a package to apply patches when operating in development mode. Typically, patches are not enabled for packages in development mode since they are primarily for helping to patch fixed revisions that have issues. However, this option can be used to allow a package in a development mode to have patches applied to them. By default, patches are never applied to development mode packages with a value of `False`.

To enable all patches to be applied when in development mode, the following flag can be set:

```
LIBFOO_DEVMODE_PATCHES = True
```

A developer can provide a pattern of patches to include:

```
LIBFOO_DEVMODE_PATCHES = '*variable-shift*'
```

Or multiple patterns:

```
LIBFOO_DEVMODE_PATCHES = [
    '007-add-mode-x.patch',
    '*-experimental-shuffle-*',
]
```

A developer can also configure the inclusion or patterns based on the specific development mode being operated on:

```
LIBFOO_DEVMODE_PATCHES = {
    'custom-mode-2': True,
    'custom-mode-3': [
        '002-disable-help.patch',
        '*-ui-tweaks-*',
    ],
}
```

See also LIBFOO_IGNORE_PATCHES and patching.

4.4.2.4 LIBFOO_DEVMODE_REVISION

Specifies a development revision for a package. When a project is being built in development mode, the development revision is used over the configured LIBFOO_REVISION value. If a development revision is not defined for a project, a package will still use the configured LIBFOO_REVISION while in development mode.

```
LIBFOO_DEVMODE_REVISION = 'feature/alpha'
```

See also LIBFOO_REVISION and LIBFOO_VERSION.

4.4.2.5 LIBFOO_DEVMODE_SKIP_INTEGRITY_CHECK

Added in version 2.8.

Flag value to indicate that a package can skip an integrity check when fetching a development revision when operating in development mode. This option can be used when a package defines a static resource with an explicit hash but opts for an alternative resource when in a development mode. Switching to an alternative static resource can result in the fetch stage failing if no alternative hashes are defined. Developers not wanting to maintain development hashes can instead configure this option if not needing an integrity check.

```
LIBFOO_DEVMODE_SKIP_INTEGRITY_CHECK = True
```

4.4.2.6 LIBFOO_EXTENSION

Changed in version 2.8: Support an empty extension value.

Specifies a filename extension for the package. A package may be cached inside the download directory to be used when the extraction phase is invoked. releng-tool attempts to determine the most ideal extension for this cache file; however some cases the detected extension may be incorrect. To deal with this situation, a developer can explicitly specify the extension value using this option.

```
LIBFOO_EXTENSION = 'tgz'
```

4.4.2.7 LIBFOO_EXTERNAL

Flag value to indicate that a package is an external package. External packages will generate warnings if hashes, an ASCII-armor or licenses are missing. By default, packages are considered external unless explicitly configured to be internal.

```
LIBFOO_EXTERNAL = True
```

See also internal and external packages.

4.4.2.8 LIBFOO_EXTOPT

Specifies extension-specific options. Packages wishing to take advantage of extension-specific capabilities can forward options to extensions by defining a dictionary of values.

```
LIBFOO_EXTOPT = {
    'option-a': True,
    'option-b': 'value',
}
```

4.4.2.9 LIBFOO_EXTRACT_TYPE

Specifies a custom extraction type for a package. If a configured extension supports a custom extraction capability, the registered extraction type can be explicitly registered in this option.

```
LIBFOO_EXTRACT_TYPE = 'ext-custom-extract'
```

4.4.2.10 LIBFOO_FETCH_OPTS

Provides a means to pass command line options into the fetch process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values which may be included in a fetch event. This field is optional. Not all site types may support this option.

```
LIBFOO_FETCH_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
}

# (or)

LIBFOO_FETCH_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.2.11 LIBFOO_FIXED_JOBS

> **Tip**
>
> It is recommended to use `LIBFOO_MAX_JOBS` instead.

Explicitly configure the total number of jobs a package will use. The primary use case for this option is to help limit the total number of jobs for a package that cannot support a large or any parallel build environment.

```
LIBFOO_FIXED_JOBS = 1
```

Note that this option will override the `--jobs` argument and can be used to exceed the jobs count (although not recommended in most scenarios).

See also the `--jobs` argument and `LIBFOO_MAX_JOBS`.

4.4.2.12 LIBFOO_GIT_CONFIG

Added in version 0.6.

Changed in version 2.2: Support added for path-like values.

Apply additional repository-specific Git configuration settings (`git config`) after a Git repository cache has been initialized. By default, no repository-specific configurations are introduced (i.e. all Git calls will use the global configuration set).

```
LIBFOO_GIT_CONFIG = {
    'core.example': 'value',
}
```

4.4.2.13 LIBFOO_GIT_DEPTH

Added in version 0.4.

Limit fetching for a Git-based source to the specified number of commits. The value provided will be used with the `--depth` argument. By default, the depth will be set to a value of `1`. If a developer wishes use fetch all commits from all refspecs, a developer can specify a value of `0`.

While the default depth is a value of `1`, an exception is made when the depth is not explicitly set and the `LIBFOO_REVISION` value defined is a hash. For this case, if the revision is not found with the implicitly-defined shallow depth of `1`, the entire history of the repository will be fetched.

```
LIBFOO_GIT_DEPTH = 0
```

See also `LIBFOO_GIT_REFSPECS` and configuration quirks.

4.4.2.14 LIBFOO_GIT_REFSPECS

Added in version 0.4.

List of addition refspecs to fetch when using a `git` VCS type. By default, a Git fetch request will acquire all `heads` and `tags` refspecs. If a developer wishes use revisions from different refspecs (for example, a pull request), a developer can specify the additional refspecs to acquire when fetching.

```
LIBFOO_GIT_REFSPECS = ['pull/*']
```

4.4.2.15 LIBFOO_GIT_SUBMODULES

Added in version 0.8.

Flag value to indicate whether a package's Git submodules should be fetched/extracted during a package's own fetch/extraction stages. By default, submodules are not fetched. Ideally, any dependencies for a package are recommended to be defined in their own individual package; however, this may not be ideal for all environments. When configured, submodules will be cached in the same fashion as other Git-based packages. Note that submodule caching is specific to the repository being processed (i.e. they cannot be "shared" between other packages). If multiple packages have the same dependency defined through a submodule, it is recommended to create a new package and reference its contents instead.

```
LIBFOO_GIT_SUBMODULES = True
```

4.4.2.16 LIBFOO_GIT_VERIFY_REVISION

Flag value to indicate whether the target revision is required to be signed before it can be used. When this value is set, the configured revision for a repository will not be extracted unless the GPG signature is verified. This includes if the public key for the author is not registered in the local system or if the target revision is not signed.

```
LIBFOO_GIT_VERIFY_REVISION = True
```

4.4.2.17 LIBFOO_HOST_PROVIDES

Added in version 0.13.

Hints at what host tools this package may be providing. A project may have a series of prerequisites, which are checked at the start of a run. This is to help ensure required host tools are available before attempting to build a project. If a package is designed to provide a host package (e.g. when using `LIBFOO_INSTALL_TYPE` with the `host` option), these packages can provide tools other packages may rely on. However, prerequisites checks will occur before these packages may be built, preventing a build from running. This option allows a developer to hint at what tools a host package may provide. By specifying the name of a tool in this option, an initial prerequisites check will not fail if a tool is not available at the start of a run.

```
LIBFOO_HOST_PROVIDES = 'some-tool'

# (or)

LIBFOO_HOST_PROVIDES = [
    'tool-a',
    'tool-b',
    'tool-c',
]
```

See also `LIBFOO_INSTALL_TYPE`.

4.4.2.18 LIBFOO_IGNORE_PATCHES

Added in version 2.9.

Flag value to indicate that a package should ignore patches found alongside the package definition. This option can be useful with `LIBFOO_DEVMODE_PATCHES` to allow a package to manage packages aimed for development mode over a primary build. By default, this option is disabled with a value of `False`.

For example, to ignore all patches in a default run:

```
LIBFOO_IGNORE_PATCHES = True
```

Developers can also configure patterns of patches to ignore:

```
LIBFOO_IGNORE_PATCHES = [
    '*-new-engine-*',
    '006-custom-int.patch',
]
```

See also `LIBFOO_DEVMODE_PATCHES` and patching.

4.4.2.19 LIBFOO_INTERNAL

Flag value to indicate that a package is an internal package. Internal packages will not generate warnings if hashes, an ASCII-armor or licenses are missing. When configured in local-sources mode, package sources are searched for in the local directory opposed to site fetched sources. By default, packages are considered external unless explicitly configured to be internal.

```
LIBFOO_INTERNAL = True
```

See also internal and external packages.

4.4.2.20 LIBFOO_MAX_JOBS

Added in version 2.8.

Configure the maximum number of jobs a package can use. This option can be used for packages that cannot support a large or any parallel build environment.

```
LIBFOO_MAX_JOBS = 1
```

This option also accepts negative values. When a negative option is provided, the total number of jobs used for a package will be the default job count less the provided value (to a minimum of one). For example, to use one less job than the total number of cores, the following can be used:

```
LIBFOO_MAX_JOBS = -1
```

See also the `--jobs` argument and `LIBFOO_FIXED_JOBS`.

4.4.2.21 LIBFOO_NO_EXTRACTION

> **Warning**
>
> If `LIBFOO_NO_EXTRACTION` is configured for a package, the package cannot define additional hashes, configure an ASCII-armor, define a list of `LIBFOO_LICENSE_FILES` to manage or expect to support various actions (such as building, since no sources are available).

Added in version 0.3.

Flag value to indicate that a package should not extract the package contents. This feature is primarily used when using releng-tool to fetch content for one or more packages (into `DL_DIR`) to be used by another package the releng-tool project defines.

```
LIBFOO_NO_EXTRACTION = True
```

Limitations exist when using the `LIBFOO_NO_EXTRACTION` option. Since releng-tool will not be used to extract a package's archive (if any), hash entries for files found inside the archive cannot be checked against. If any files other than the archive itself is listed, releng-tool will stop processing due to a hash check failure. In addition, since releng-tool does not have the extracted contents of an archive, it is unable to acquire a copy of the project's license file. Specifying `LIBFOO_LICENSE_FILES` for projects with the no-extraction flag enabled will result in a warning. By default, this option is disabled with a value of `False`.

4.4.2.22 LIBFOO_ONLY_DEVMODE

Added in version 2.9.

Flag whether this package should only be used when running in a development mode. Typically, packages that are registered in the releng-tool pipeline will get processed for a build. If a developer wishes to introduced a new package that is aimed for development, they may use various conditionals to avoid enabling a package in the main pipeline.

This option aims to make a developers life a bit more flexible by allow a package to be excluded even if registered in the package chain. This can allow a project to easily prepare for a future package integration with a single flag until the primary build is ready to enable the new package. By default, this option is disabled with a value of `False`.

```
LIBFOO_ONLY_DEVMODE = True
```

Developers can also hint specific development modes this package is enabled. For example, if looking to target two specific development modes, the following may be used:

```
LIBFOO_ONLY_DEVMODE = [
    'mode-a',
    'mode-c',
]
```

4.4.2.23 LIBFOO_PATCH_SUBDIR

Added in version 0.15.

Changed in version 2.2: Support added for path-like values.

Sub-directory where any package patches should be applied to. By default, patches are applied to the root of the extracted sources for a package. This option can be useful for packages which utilize `LIBFOO_BUILD_SUBDIR` to work in a container directory for sources which contain multiple modules, but has prepared patches tailored for the specific module being targeted.

```
LIBFOO_PATCH_SUBDIR = 'subdir'
```

See also `LIBFOO_BUILD_SUBDIR`.

4.4.2.24 LIBFOO_PREEXTRACT

Added in version 2.7.

Flag value to indicate that a package should attempt to extract the package contents before any configuration stage of all other packages are performed. By default, this option is disabled with a value of `False`.

```
LIBFOO_PREEXTRACT = True
```

Ideally, package configurations can utilize `LIBFOO_NEEDS` to manage the order of processed packages. However, in the scenario where package dependencies result in a cyclic dependency, releng-tool will report an error since a known dependency order is require for a consistent build pipeline.

In situations where two or more packages do depend on each other, developers can utilize this pre-extraction flag to hint that packages should already be extracted before any other package attempts to configure/build. For example, if `libfoo` and `libbar` both depend on each other, developers can configure `LIBFOO_PREEXTRACT = True` and `LIBBAR_PREEXTRACT = True` in each package's respective definition. The processed order of packages will still be driven by any `LIBFOO_NEEDS` options set (that do not result in a cyclic error) and the order defined by `packages`.

4.4.2.25 LIBFOO_PREFIX

Changed in version 2.2: Support added for path-like values.

Specifies the sysroot prefix value to use for the package. An explicitly provided prefix value will override the project-defined or default sysroot prefix value.

```
LIBFOO_PREFIX = '/usr'
```

See also `PREFIX` and `sysroot_prefix`.

4.4.2.26 LIBFOO_REMOTE_CONFIG

Added in version 1.3.

Deprecated since version 2.9: This feature is planned to be removed in the future.

Flag value to indicate that a package should attempt to load any package configurations which may be defined in the package's source. If the package includes a `.releng-tool` file at the root of their sources, supported configuration options that have not been populated will be registered into the package before invoking a package's configuration stage.

```
LIBFOO_REMOTE_CONFIG = True
```

See also `releng.disable_remote_configs` quirk.

4.4.2.27 LIBFOO_REMOTE_SCRIPTS

Added in version 1.3.

Deprecated since version 2.9: This feature is planned to be removed in the future.

Flag value to indicate that a package should attempt to load any package scripts which may be defined in the package's source. Typically, a script-based package will load configuration, build, etc. scripts from its package definition folder. If a script-based package is missing a stage script to invoke and finds an associated script in the package's source, the detected script will be invoked. For example, if `libfoo.rt` package may attempt to load a `libfoo-configure.rt` script for a configuration stage. In the event that the script cannot be found and remote scripting is permitted for a package, the script (if exists) `releng-configure.rt` will be loaded from the root of the package's contents.

```
LIBFOO_REMOTE_CONFIG = True
```

See also `releng.disable_remote_scripts` quirk.

4.4.2.28 LIBFOO_REVISION

Specifies a revision value for a package. When a package fetches content using source management tools, the revision value is used to determine which sources should be acquired (e.g. a tag). If a revision is not defined package, a package will use the configured `LIBFOO_VERSION`.

```
LIBFOO_REVISION = 'libfoo-v2.1'
```

For users planning to take advantage of development mode capabilities, multiple revisions can be configured based off the mode:

```
LIBFOO_REVISION = {
    DEFAULT_REVISION: 'libfoo-v2.1',
    'develop': 'main',
}
```

See also LIBFOO_DEVMODE_REVISION, LIBFOO_VERSION and revisions.

4.4.2.29 LIBFOO_STRIP_COUNT

Specifies the strip count to use when attempting to extract sources from an archive. By default, the extraction process will strip a single directory from an archive (value: 1). If a package's archive has no container directory, a strip count of zero can be set; likewise if an archive contains multiple container directories, a higher strip count can be set.

```
LIBFOO_STRIP_COUNT = 1
```

4.4.2.30 LIBFOO_VCS_TYPE

Changed in version 0.4: Support added for local.

Changed in version 0.10: Support added for rsync.

Changed in version 0.17: Support added for perforce.

Changed in version 1.4: Support added for brz.

Changed in version 2.0: Support added for file.

Deprecated since version 2.0: Support for bzr (Bazaar) sites is deprecated.

Deprecated since version 2.0: URL types no longer accept file:// URIs. Packages explicitly defining a url type with a file URI will automatically be converted into a file type. Projects should switch to defining file if they wish to explicitly set the VCS type.

Explicitly sets the version control system type to use when acquiring sources. releng-tool attempts to automatically determine the VCS type of a package based off a LIBFOO_SITE value. In some scenarios, a site value may be unable to specify a desired prefix/postfix. A developer can instead explicitly set the VCS type to be used no matter what the site value is configured as.

Supported types are as follows:

- brz (Breezy)
- bzr (Bazaar) *(deprecated)*
- cvs (CVS)
- file (File URI)
- git (Git)
- hg (Mercurial)
- local (no VCS; local interim-development package)
- none (no VCS; virtual package)
- perforce (Perforce)
- rsync (rsync)
- scp (SCP)
- svn (SVN)
- url (URL)

```
LIBFOO_VCS_TYPE = 'git'
```

If a project registers a custom extension which provides a custom VCS type, the extension type can be set in this option.

For users planning to take advantage of development mode capabilities with mode-specific sites, users can provide an explicit VCS type based off a configured mode:

```
LIBFOO_VCS_TYPE = {
    DEFAULT_REVISION: 'git',
    'legacy': 'cvs',
}
```

Using a specific type will create a dependency for a project that the respective host tool is installed on the host system. For example, if a Git VCS-type is set, the host system will need to have `git` installed on the system.

The use of the `local` type is designed to be a special/development-helper type only. When set, this option allows placing the sources of a package directly inside a `local` folder inside the definition folder. For example, a package `libfoo` configured with a local type would be structured as follows:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── local/                <----
    │       │   ├── src/
    │       │   │   └── ...
    │       │   └── Makefile
    │       └── libfoo.rt
    ...
```

This approach is similar to using local-sources mode, where it avoids the need to have the module content located in a site to be fetched – specifically, for initial development/testing/training scenarios. It is never recommended to store the package's "main content" inside a releng-tool project, thus using the `local` type will always generate a warning message.

4.4.3 System-specific package options

The following outlines system-specific configuration options available for packages.

4.4.3.1 LIBFOO_VSDEVCMD

> **Note**
>
> The option is ignored in non-Windows environments.

Added in version 1.3.

Allows a package to automatically load Visual Studio Developer Command Prompt (`VsDevCmd.bat`) variables into the releng-tool process. This will allow a package to invoke commands as if releng-tool was started from within a Visual Studio Developer Command Prompt.

```
LIBFOO_VSDEVCMD = True
```

A package looking to use an explicit version of Visual Studio can specify a version string that is compatible with Visual Studio Locator's (vswhere) `-version` argument.

```
LIBFOO_VSDEVCMD = '[17.0,18.0)'
```

See also `vsdevcmd` and `LIBFOO_VSDEVCMD_PRODUCTS`.

4.4.3.2 LIBFOO_VSDEVCMD_PRODUCTS

> **Note**
>
> The option is ignored in non-Windows environments.

Added in version 2.4.

Allows a package to configure which products to search for when releng-tool invokes Visual Studio Locator to find which Visual Studio tooling to use. By default, releng-tool operates as if `vswhere` is invoked with the `-products *` argument. Providing a string in this option replaces the asterisk value with the configured value.

```
LIBFOO_VSDEVCMD_PRODUCTS = 'Microsoft.VisualStudio.Product.BuildTools'
```

See also `vsdevcmd_products` and `LIBFOO_VSDEVCMD`.

4.4.4 Package bootstrapping

Added in version 0.3.

Every package, no matter which package `LIBFOO_TYPE` is defined, can create a bootstrapping script to invoke before a package starts a configuration stage. The existence of a `<package>-bootstrap.rt` inside a package directory will trigger the bootstrapping stage for the package. An example bootstrapping script for a package `libfoo` would be named `libfoo-bootstrap.rt`:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.rt
    │       └── libfoo-bootstrap.rt   <----
    ...
```

With the contents of `libfoo-bootstrap.rt` being set to:

```
print('perform bootstrapping work')
```

May generate an output such as follows:

```
$ releng-tool libfoo
patching libfoo...
perform bootstrapping work
configuring libfoo...
building libfoo...
installing libfoo...
```

Bootstrapping scripts for a package are optional. If no bootstrapping script is provided for a package, no bootstrapping stage will be performed for the package.

See script helpers for helper functions and variables available for use. Developers may also be interested in using a post-processing script.

4.4.5 Package post-processing

Every package, no matter which package `LIBFOO_TYPE` is defined, can create a post-processing script to invoke after a package has completed an installation stage. The existence of a `<package>-post.rt` inside a package directory will trigger the post-processing stage for the package. An example post-processing script for a package `libfoo` would be named `libfoo-post.rt`:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.rt
    │       └── libfoo-post.rt        <----
    ...
```

With the contents of `libfoo-post.rt` being set to:

```
print('perform post-processing work')
```

May generate an output such as follows:

```
$ releng-tool libfoo
patching libfoo...
configuring libfoo...
building libfoo...
installing libfoo...
perform post-processing work
```

Post-processing scripts for a package are optional. If no post-processing script is provided for a package, no post-processing stage will be performed for the package.

See script helpers for helper functions and variables available for use. Developers may also be interested in using a bootstrapping script.

4.4.6 Site definitions

The following outlines the details for defining supported site definitions. If attempting to use an extension-provided site type, please refer to the documentation provided by the extension.

> **Note**
>
> All site values can be defined with a unique prefix value (e.g. `git+` for Git sources); however, this is optional if a package wishes to use the `LIBFOO_VCS_TYPE` option.

4.4.6.1 Breezy site

Added in version 1.4.

To define a Breezy-based location, the site value must be prefixed with a `brz+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'brz+https://example.com/project/trunk'
# (or)
LIBFOO_SITE = 'brz+lp:<project>'
```

The value after the prefix is a path which will be provided to a `brz export` call[1]. Content from a Bazaar or Git

[1] https://www.breezy-vcs.org/doc/en/user-reference/export-help.html

repository will be fetched and archived into a file during fetch stage. Once a cached archive is made, the fetch stage will be skipped unless the archive is manually removed.

The following shows an example of cloning a v1.0 tag:

```
LIBFOO_REVISION = 'tag:v${LIBFOO_VERSION}'
LIBFOO_SITE = 'brz+https://example.com/project/trunk'
LIBFOO_VERSION = '1.0'
```

The following shows an example of cloning the latest trunk branch:

```
LIBFOO_REVISION = '-1'
LIBFOO_SITE = 'brz+https://example.com/project/trunk'
```

4.4.6.2 Bazaar site

Deprecated since version 2.0: Support for Bazaar sites is deprecated.

To define a Bazaar-based location, the site value must be prefixed with a `bzr+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'bzr+ssh://example.com/project/trunk'
# (or)
LIBFOO_SITE = 'bzr+lp:<project>'
```

The value after the prefix is a path which will be provided to a `bzr export` call[2]. Content from a Bazaar repository will be fetched and archived into a file during fetch stage. Once a cached archive is made, the fetch stage will be skipped unless the archive is manually removed.

4.4.6.3 CVS site

To define a CVS-based location, the site value must be prefixed with a `cvs+` or other common CVSROOT value. A site can be defined as follows:

```
LIBFOO_SITE = ':pserver:anonymous@cvs.example.com:/var/lib/cvsroot mymodule'
# (or)
LIBFOO_SITE = 'cvs+:ext:cvs@cvs.example.org:/usr/local/cvsroot mymodule'
```

The value after the prefix is a space-separated pair, where the first part represents the CVSROOT[3] to use and the second part specifies the CVS module[4] to use. Content from a CVS repository will be fetched and archived into a file during fetch stage. Once a cached archive is made, the fetch stage will be skipped unless the archive is manually removed.

The following shows an example of cloning a libfoo-1.2.3 tag:

```
LIBFOO_REVISION = 'libfoo-${LIBFOO_VERSION}'
LIBFOO_SITE = ':pserver:anonymous@cvs.example.com:/var/lib/cvsroot libfoo'
LIBFOO_VERSION = '1.2.3'
```

The following shows an example of cloning a v1.x LTS branch:

```
LIBFOO_REVISION = 'lts-1.x'
LIBFOO_SITE = ':pserver:anonymous@cvs.example.com:/var/lib/cvsroot libfoo'
```

[2] https://web.archive.org/web/http://doc.bazaar.canonical.com/bzr.2.7/en/user-reference/export-help.html
[3] https://www.gnu.org/software/trans-coord/manual/cvs/html_node/Specifying-a-repository.html
[4] https://www.gnu.org/software/trans-coord/manual/cvs/html_node/checkout.html#checkout

4.4.6.4 File site

Added in version 2.0.

Site type dedicated for accepting a file uniform resource identifier (`file://`). The site value also accepts the `file+` prefix.

```
LIBFOO_SITE = 'file:///mnt/share/libfoo.tgz'
# (or)
LIBFOO_SITE = 'file+/mnt/share/libfoo.tgz'
```

4.4.6.5 Git site

To define a Git-based location, the site value must be prefixed with a `git+` value or postfixed with the `.git` value. A site can be defined as follows:

```
LIBFOO_SITE = 'https://example.com/libfoo.git'
# (or)
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
```

The site value (less prefix, if used) is used as a Git remote[5] for a locally managed cache source. Git sources will be cached inside the `cache` directory on first-run. Future runs to fetch a project's source will use the cached Git file system. If a desired revision exists, content will be acquired from the cache location. If a desired revision does not exist, the origin remote will be fetched for the new revision (if it exists).

The following shows an example of cloning a v1.2.3 tag:

```
LIBFOO_REVISION = 'v${LIBFOO_VERSION}'
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
LIBFOO_VERSION = '1.2.3'
```

The following shows an example of cloning a v1.x LTS branch:

```
LIBFOO_REVISION = 'lts-1.x'
LIBFOO_SITE = 'https://example.com/libfoo.git'
```

The following shows an example of cloning with a commit hash:

```
LIBFOO_REVISION = 'da39a3ee5e6b4b0d3255bfef95601890afd80709'
LIBFOO_SITE = 'git+ssh://git.example.com/group/libfoo.git'
```

4.4.6.6 Local site

To define a package to use local site/sources, the site value can be set to `local`. A local site can be defined as follows:

```
LIBFOO_SITE = 'local'
```

This is equivalent to configuring `LIBFOO_VCS_TYPE` to a `local` VCS type as well. Note that a local package is intended for development/testing/training purposes. See `LIBFOO_VCS_TYPE` for more information.

[5] https://git-scm.com/docs/git-remote

4.4.6.7 Mercurial site

To define a Mercurial-based location, the site value must be prefixed with a `hg+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'hg+https://example.com/project'
```

The value after the prefix is used as the `SOURCE` in an `hg clone` call[6]. Mercurial sources will be cached inside the `cache` directory on first-run. Future runs to fetch a project's source will use the cached Mercurial repository. If a desired revision exists, content will be acquired from the cache location. If a desired revision does not exist, the origin remote will be pulled for the new revision (if it exists).

The following shows an example of cloning a v1.2.3 tag:

```
LIBFOO_REVISION = 'v${LIBFOO_VERSION}'
LIBFOO_SITE = 'hg+https://hg.example.org/repo/hello'
LIBFOO_VERSION = '1.2.3'
```

The following shows an example of cloning a v1.x LTS branch:

```
LIBFOO_REVISION = 'lts-1.x'
LIBFOO_SITE = 'hg+https://hg.example.org/repo/hello'
```

4.4.6.8 Perforce site

Added in version 0.17.

To define a Perforce-based location, the site value must be prefixed with an `perforce+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'perforce+srcs.example.com:1666 //base/libfoo/main'
# (or)
LIBFOO_SITE = 'perforce+guest@tcp4:perforce.example.org:1666 //guest/libfoo'
```

The value after the prefix is a space-separated pair, where the first part represents the Perforce service (`P4PORT`[7]) to use and the second part specifies the Perforce depot path. Perforce data is fetched using `git p4 <option>`[8] command. This requires a host to have both Git and Perforce's Helix Command-Line Client (P4) installed. Content from a Perforce depot will be fetched and archived into a file during fetch stage. Once a cached archive is made, the fetch stage ill be skipped unless the archive is manually removed.

The following shows an example of cloning the 27574 revision:

```
LIBFOO_SITE = 'perforce+srcs.example.com:1666 //base/libfoo/main'
LIBFOO_VERSION = '27574'
```

4.4.6.9 rsync site

Added in version 0.10.

To define an rsync-based location, the site value must be prefixed with an `rsync+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'rsync+<source>'
```

The value of `<source>` will be provided to a `rsync` call's[9] `SRC` value. Fetched content will be stored in an

[6] https://www.mercurial-scm.org/help/commands/clone
[7] https://www.perforce.com/manuals/cmdref/Content/CmdRef/P4PORT.html
[8] https://git-scm.com/docs/git-p4
[9] https://linux.die.net/man/1/rsync

archive inside the `dl` directory. Once fetched, the fetch stage will be skipped unless the archive is manually removed. By default, the `--recursive` argument is applied. Adding or replacing options can be done by using the `LIBFOO_FETCH_OPTS` option.

4.4.6.10 SCP site

To define an SCP-based location, the site value must be prefixed with a `scp+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'scp+[user@]host:]file'
```

The value after the prefix is a path which will be provided to a `scp` call's[10] source host value. The SCP site only supports copying a file from a remote host. The fetched file will be stored inside the `dl` directory. Once fetched, the fetch stage will be skipped unless the file is manually removed.

4.4.6.11 SVN site

To define a Subversion-based location, the site value must be prefixed with a `svn+` value. A site can be defined as follows:

```
LIBFOO_SITE = 'svn+https://svn.example.com/repos/libfoo/c/branches/libfoo-1.2'
```

The value after the prefix is a path which will be provided to a `svn checkout` call[11]. Content from a Subversion repository will be fetched and archived into a file during fetch stage. Once a cached archive is made, the fetch stage will be skipped unless the archive is manually removed.

The following shows an example of cloning a v1.2.3 tag with a fixed SVN revision value:

```
LIBFOO_REVISION = 46801
LIBFOO_SITE = 'svn+https://svn.example.com/repos/libfoo/c/tags/${LIBFOO_VERSION}'
LIBFOO_VERSION = '1.2.3'
```

This ensures a fixed/repeatable clone experience.

The following shows an example of cloning a v1.2.3 tag with a flexible revision value:

```
LIBFOO_REVISION = 'HEAD'
LIBFOO_SITE = 'svn+https://svn.example.com/repos/libfoo/c/tags/${LIBFOO_VERSION}'
LIBFOO_VERSION = '1.2.3'
```

Provides a simple definition to clone a tag without needing to determine an explicit SVN revision. This approach supports moved tags.

The following shows an example of cloning a v1.x LTS branch:

```
LIBFOO_REVISION = 'HEAD'
LIBFOO_SITE = 'svn+https://svn.example.com/repos/libfoo/c/branches/1.x-lts'
```

4.4.6.12 URL site (default)

All packages that do not define a helper prefix/postfix value (as seen in other site definitions) or do not explicitly set a `LIBFOO_VCS_TYPE` value (other than `url`), will be considered a URL site. A URL site can be defined as follows:

```
LIBFOO_SITE = 'https://example.com/my-file'
```

[10] https://linux.die.net/man/1/scp
[11] http://svnbook.red-bean.com/en/1.7/svn.ref.svn.c.checkout.html

The site value provided will be directly used in a URL request. URL values supported are defined by the Python's `urlopen` implementation[12], which includes (but not limited to) `http(s)://`, `ftp://` and more.

See also `urlopen_context`.

4.4.7 Hash file

> **Note**
>
> An alternative to using a hash to validate a package's cache is to use an ASCII-armor instead. Although users can benefit from using both validation methods, if desired.

When downloading assets from a remote instance, a package's hash file can be used to help verify the integrity of any fetched content. For example, if a package lists a site with a `my-archive.tgz` to download, the fetch process will download the archive and verify its hash to a listed entry before continuing. If a hash does not match, the build process stops indicating an unexpected asset was downloaded.

It is recommended that:

- Any URL-based site asset have a hash entry defined for the asset (to ensure the package sources are not corrupted or have been unexpectedly replaced).
- A hash entry should exist for license files (additional sanity check if a package's license has change).

To create a hash file for a package, add a `<my-package>.hash` file inside the package's directory. For example, for a `libfoo` package, the following would be expected:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.hash           <----
    │       └── libfoo.rt
    ...
```

The hash file should be a UTF-8 encoded file and can contain multiple hash entries. A hash entry is a 3-tuple defining the type of hash algorithm used, the hash value expected and the asset associated with the hash. A tuple entry is defined on a single line with each entry separated by whitespace characters. For example:

```
# from project's release notes: https://example.com/release-notes
sha1 f606cb022b86086407ad735bf4ec83478dc0a2c5 my-archive.tgz
# locally computed
sha1 602effb4893c7504ffee8a8efcd265d86cd21609 LICENSE
```

Comments are permitted in the file. Lines leading with a `#` character or inlined leading `#` character after a whitespace character will be ignored.

Supported hash types will vary on the Python interpreter[1] used. Typically, this include FIPS secure hash algorithms (e.g. `sha1`, `sha224`, `sha256`, `sha384` and `sha512`) as well as (but not recommended) RSA'S MD5 algorithm. For hash algorithms requiring a key length, a user can define a hash entry using the format `<hash-type>:<key-length>`. For example, `shake_128:32`. Other algorithms may be used if provided by the system's OpenSSL library.

[12] https://docs.python.org/library/urllib.request.html#urllib.request.urlopen
[1] https://docs.python.org/library/hashlib.html

Multiple hash entries can be provided for the same file if desired. This is to assist in scenarios where a checked out asset's content changes based on the system it is checked out on. For example, a text file checked out from Git may use Windows line-ending on Windows system, and Unix-line endings on other systems:

```
sha1 602effb4893c7504ffee8a8efcd265d86cd21609 LICENSE
sha1 9e79b84ef32e911f8056d80a311cf281b2121469 LICENSE
```

If operating in a development mode where an external package is configured with an alternative revision, hash checks for a package can fail. A developer can override hash checks for a specific revision by adding an additional file in the package directory. The format is `libfoo.hash-<revision>`. For example, if a development run points to a package revision `canary`, if a file named `libfoo.hash-canary` exists, it will be used as the source of hashes for this revision.

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.hash
    │       ├── libfoo.hash-canary    <----
    │       └── libfoo.rt
    ...
```

4.4.8 ASCII armor

> **Note**
>
> An alternative to using an ASCII-armor to validate a package's cache is to use hashes instead.

When downloading assets from a remote instance, an ASCII-armor file can be used to help verify the integrity of any fetched content. For example, if a package lists a site with a `my-archive.tgz` to download, the fetch process will download the archive and verify its contents with an associated ASCII-armor file (if one is provided). If the integrity of the file cannot be verified, the build process stops indicating an unexpected asset was downloaded.

To include an ASCII-armor file for a package, add a `<my-package>.asc` file inside the package's directory. For example, for a `libfoo` package, the following would be expected:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.asc           <----
    │       └── libfoo.rt
    ...
```

Verification is performed using the host system's `gpg`. For verification's to succeed, the system must already have the required public keys registered.

4.4.9 Script package (default)

A script-based package is the most basic package type available. By default, packages are considered to be script packages unless explicitly configured to be another package type (`LIBFOO_TYPE`). If a developer wishes to explicitly configure a project as script-based, the following configuration can be used:

```
LIBFOO_TYPE = 'script'
```

A script package has the ability to define three Python stage scripts:

- `<package>-configure.rt` - script to invoke during the configuration stage
- `<package>-build.rt` - script to invoke during the build stage
- `<package>-install.rt` - script to invoke during the installation stage

For example, a `libfoo` package would have the following files for a script-based package:

```
└── my-releng-tool-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.rt
    │       ├── libfoo-build.rt
    │       ├── libfoo-configure.rt
    │       └── libfoo-install.rt
    ...
```

An example build script (`libfoo-build.rt`) can be as follows:

```
releng_execute(['make'])
```

When a package performs a configuration, build or installation stage; the respective script (mentioned above) will be invoked. Package scripts are optional. If a script is not provided for a stage, the stage will be skipped.

See also script helpers for helper functions and variables available for use, as well as bootstrapping or post-processing for more stage script support.

4.4.10 Autotools package

An Autotools package provides support for processing a GNU Build System supported module.

```
LIBFOO_TYPE = 'autotools'
```

The following shows the default arguments used in stages and outlines configuration options that are available for an Autotools package to set. See also the Autotools package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.10.1 Configuration stage

The configuration stage will invoke `./configure` with the arguments:

```
./configure --exec-prefix <PREFIX> --prefix <PREFIX>
```

The prefix arguments are configured to `LIBFOO_PREFIX`.

If `LIBFOO_AUTOTOOLS_AUTORECONF` is configured, `autoreconf` will be invoked before `./configure` is started:

```
autoreconf
```

4.4.10.2 Build stage

The build stage invokes `make` with the arguments:

```
make --jobs <NJOBS>
```

The number of jobs is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the argument will not be used.

4.4.10.3 Install stage

The install stage invokes `make` with an `install` target:

```
make install
```

With the following environment variables set:

```
DESTDIR=<TARGET_DIR>
```

The `DESTDIR` path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `make install` may be invoked multiple times for each target it needs to install into.

If a package defines install options, the `install` target is not provided by default.

4.4.10.4 LIBFOO_AUTOTOOLS_AUTORECONF

Specifies whether the package needs to perform an Autotools re-configuration. This is to assist in the rebuilding of GNU Build System files which may be broken or a patch has introduced new build script changes that need to be applied. This field is optional. By default, `autoreconf` is not invoked.

```
LIBFOO_AUTOTOOLS_AUTORECONF = True
```

4.4.10.5 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.10.6 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.10.7 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.10.8 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.10.9 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.10.10 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
```

(continues on next page)

(continued from previous page)

```
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.10.11 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.10.12 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.10.13 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.10.14 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # include the "install" target to the command
    'install': '',
    # adds "--option value" to the command
    '--option': 'value',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # include the "install" target to the command
    'install',
    # adds "--some-option" to the command
    '--some-option',
]
```

Defining custom install options will prevent the default `install` target from being added. Users looking to utilize the `install` target for the install stage with custom arguments should explicitly include the `install` target in their options.

4.4.11 Cargo package

Added in version 1.3.

Changed in version 1.4: Added support for dependency patching.

A Cargo package provides support for processing a Cargo supported module.

```
LIBFOO_TYPE = 'cargo'
```

During the configuration stage of a Cargo package, `cargo` will be invoked to generate build files for the module. After fetching and extracting a package, `cargo vendor` will be invoked to download any defined dependencies defined in `Cargo.toml`. After all dependencies are acquired, a build stage will be triggered using `cargo build`, followed by an installation stage using `cargo install`. Each stage can be configured to manipulate environment variables and options used by the Cargo executable.

Cargo packages are handled a bit differently compared to other package types. In order to support having Cargo application packages work with library dependencies managed in a releng-tool project, all Cargo packages in play will need to be extracted ahead of time before any individual Cargo package can be built.

For any Cargo package that defines a dependency to another Cargo package that is defined inside a releng-tool project, dependencies will be automatically patched to use the local package definition.

The following shows the default arguments used in stages and outlines configuration options that are available for an Cargo package to set. See also the Cargo package examples. All stages are invoked with:

- A `PKG_BUILD_DIR` working directory.
- The environment variable `CARGO_HOME` set to `<CACHE_DIR>/.cargo` (see also `CACHE_DIR`).

4.4.11.1 Configuration stage

Cargo package do not have a configuration stage.

4.4.11.2 Build stage

The build stage invokes `cargo build` with the arguments:

```
cargo build \
    --locked \
    --manifest-path Cargo.toml \
    --offline \
    --release \
    --target-dir <CARGO_STAGING_DIR>
```

With the following environment variables set:

```
CARGO_BUILD_JOBS=<NJOBS>
```

If `LIBFOO_VCS_TYPE` is configured to `local`, the `--locked` argument is not provided by default.

If a package defines build options that define a build profile (`--profile`), the `--release` argument is not provided by default.

The Cargo target directory is based on `BUILD_DIR` and `.releng-tool-cargo-target` folder:

```
<root-dir>/output/build/.releng-tool-cargo-target
```

The environment variable `CARGO_BUILD_JOBS` is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`.

4.4.11.3 Install stage

The install stage invokes `cargo install` with the arguments:

```
cargo install \
    --force \
    --locked \
    --no-track \
    --offline \
    --path . \
    --root <TARGET_DIR> \
    --target-dir <CARGO_STAGING_DIR>
```

The Cargo target directory is based on `BUILD_DIR` and `.releng-tool-cargo-target` folder:

```
<root-dir>/output/build/.releng-tool-cargo-target
```

The `--root` path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `cargo install` may be invoked multiple times for each target it needs to install into. Although, if a package defines build options that define a root path (`--root`), an install is only invoked once with the provided path.

The installation stage can be skipped by configuring `LIBFOO_CARGO_NOINSTALL`.

4.4.11.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.11.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.11.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.11.7 LIBFOO_CARGO_NAME

Added in version 1.4.

Provides an explicit name to use for a Cargo package. By default, the used Cargo name is assumed to be the same as the package name used in releng-tool. If the names do not match, it is recommended to explicitly set the package name as it will be used to patch package dependencies together.

```
LIBFOO_CARGO_NAME = 'example-name'
```

4.4.11.8 LIBFOO_CARGO_NOINSTALL

Added in version 1.4.

Specifies whether the Cargo package should skip an attempt to invoke the install command. This option can be helpful when defining a Cargo package that is used as a library (instead of a full application). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_CARGO_NOINSTALL = True
```

4.4.11.9 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.11.10 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.11.11 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.11.12 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.12 CMake package

Changed in version 2.6: releng-tool now populates `CMAKE_FIND_ROOT_PATH`.

A CMake package provides support for processing a CMake supported module.

```
LIBFOO_TYPE = 'cmake'
```

During the configuration stage of a CMake package, `cmake` will be invoked to generate build files for the module. For the build stage, `cmake --build` will invoke the generated build files. Similar approach for the installation stage where the build option is invoked again but with the `install` target invoked: `cmake --build --target install`. Each stage can be configured to manipulate environment variables and options used by the CMake executable.

The default configuration built for projects is `RelWithDebInfo`. A developer can override this option by explicitly adjusting the configuration option `LIBFOO_CMAKE_BUILD_TYPE` to, for example, `Debug`:

```
LIBFOO_CMAKE_BUILD_TYPE = 'Debug'
```

Packages can be configured with a toolchain using with the define `CMAKE_TOOLCHAIN_FILE` (via `LIBFOO_CONF_DEFS`) or using the command line option `--toolchain` (via `LIBFOO_CONF_OPTS`). releng-tool will provide required staging/target paths through the `CMAKE_FIND_ROOT_PATH` configuration. Ensure the toolchain configuration accepts `CMAKE_FIND_ROOT_PATH` hints. For example, using either:

```
list(APPEND CMAKE_FIND_ROOT_PATH "INTERNAL_SDK_PATH")
```

Or:

```
if(NOT DEFINED CMAKE_FIND_ROOT_PATH)
    set(CMAKE_FIND_ROOT_PATH "INTERNAL_SDK_PATH")
endif()
```

The following shows the default arguments used in stages and outlines configuration options that are available for an CMake package to set. See also the CMake package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.12.1 Configuration stage

The configuration stage invokes `cmake` with the arguments:

```
cmake -C <RELENG-TOOL-CONFIG-CACHE> <PROJECT_DIR>
```

With the configuration cache that populates the options:

```
CMAKE_<LANG>_STANDARD_INCLUDE_DIRECTORIES=<INCLUDE_PATHS>
CMAKE_BUILD_TYPE=<BUILD_TYPE>
CMAKE_FIND_ROOT_PATH=<SYSROOT_PATHS>
CMAKE_FIND_ROOT_PATH_MODE_PROGRAM=NEVER
CMAKE_INCLUDE_PATH=<INCLUDE_PATHS>
CMAKE_INSTALL_LIBDIR="lib"
CMAKE_INSTALL_PREFIX=<PREFIX>
CMAKE_LIBRARY_PATH=<LIBRARY_PATHS>
CMAKE_MODULE_PATH=<MODULE_PATHS>
CMAKE_SKIP_INSTALL_ALL_DEPENDENCY=ON
```

The project directory is configured to `PKG_BUILD_DIR`.

The build type is configured by `LIBFOO_CMAKE_BUILD_TYPE`.

Paths may vary based on how the package's `LIBFOO_INSTALL_TYPE` is configured. System root paths provided will only include the staging directory if `staging` is configured. Both the staging and target directories are provided is the `target` is configured. Likewise with the host directory if `host` is configured.

The same concepts apply for defined include (`<sysroot>[/<prefix>]/include`), library (`<sysroot>[/<prefix>]/lib`) and module paths (`<sysroot>[/<prefix>]/share/cmake/Modules`).

Packages may override default defines using the `LIBFOO_CONF_DEFS` option.

A package may opt-out of configuring `CMAKE_<LANG>_STANDARD_INCLUDE_DIRECTORIES` variables using the `releng.cmake.disable_direct_includes` quirk.

4.4.12.2 Build stage

The build stage invokes `cmake` with the arguments:

```
cmake --build <BUILD_OUTPUT_DIR> --config <BUILD_TYPE>
```

With the following environment variables set:

```
CMAKE_BUILD_PARALLEL_LEVEL=<NJOBS>
```

The `--build` directory is configured to `PKG_BUILD_OUTPUT_DIR`.

The `--config` type is configured to the value defined for `LIBFOO_CMAKE_BUILD_TYPE`. Although, this option may not be applicable/used in all build environments.

The environment variable `CMAKE_BUILD_PARALLEL_LEVEL` is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the environment variable will not be set.

4.4.12.3 Install stage

The install stage invokes `cmake` with the arguments:

```
cmake \
    --build <BUILD_OUTPUT_DIR> \
    --config <BUILD_TYPE> \
    --target install
```

With the following environment variables set:

```
CMAKE_INSTALL_ALWAYS=1
DESTDIR=<TARGET_DIR>
```

The `--build` directory is configured to `PKG_BUILD_OUTPUT_DIR`.

The `--config` type is configured to the value defined for `LIBFOO_CMAKE_BUILD_TYPE`. Although, this option may not be applicable/used in all build environments.

The `DESTDIR` path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `cmake` may be invoked multiple times for each target it needs to install into.

The installation stage can be skipped by configuring `LIBFOO_CMAKE_NOINSTALL`.

4.4.12.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.12.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.12.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
```

(continues on next page)

(continued from previous page)

```
    '--some-option',
]
```

4.4.12.7 LIBFOO_CMAKE_BUILD_TYPE

Added in version 0.17.

Specifies the build type used for the CMake package. A package may use a common build type (`Debug`, `Release`, `RelWithDebInfo` or `MinSizeRel`), or may have a custom build type defined. A developer needing to use a specific build type can configure this option with the name of the configuration. By default, the `RelWithDebInfo` build type is used for all CMake packages.

```
LIBFOO_CMAKE_BUILD_TYPE = 'Debug'
```

See also `default_cmake_build_type`.

4.4.12.8 LIBFOO_CMAKE_NOINSTALL

Added in version 0.10.

Specifies whether the CMake package should skip an attempt to invoke the install command. Ideally, projects will have an install rule configured to define how a project will install files into a target (or staging) environment. Not all CMake projects may have this rule defined, which can cause the installation stage for a package to fail. A developer can specify this no-install flag to skip a CMake-driven install request and manage installation actions through other means (such as post-processing). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_CMAKE_NOINSTALL = True
```

4.4.12.9 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.12.10 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.12.11 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.12.12 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.12.13 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.12.14 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.12.15 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.13 Make package

Added in version 0.13.

A Make package provides support to easily invoke GNU Make commands at various stages of a package.

```
LIBFOO_TYPE = 'make'
```

Make-based projects by default will invoke the default target during the build stage, and invoke the `install` target for the installation stage.

The following shows the default arguments used in stages and outlines configuration options that are available for a Make package to set. See also the Make package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.13.1 Configuration stage

Default configurations for make packages will not run a configuration stage. However, if a user wants to run a specific target during this stage, a target can be added into the configuration options. For example, if the Makefile configuration has a target `prework` that should be invoked during the configuration stage, the following can be used:

```
LIBFOO_CONF_OPTS = [
    'prework',
]
```

Which will invoke `make` with the arguments:

```
make prework
```

Alternatively, if no configuration options are specified, a `<package>-configure` script can be invoked if available.

4.4.13.2 Build stage

The build stage invokes `make` with the arguments:

```
make --jobs <NJOBS>
```

This will trigger the default target for the Makefile configuration. Developers can configure a specific target to invoke during the build stage by specifying a `LIBFOO_BUILD_OPTS` configuration. For example, if a package uses the target `release` for standard release builds, the following can be used:

```
LIBFOO_BUILD_OPTS = [
    'release',
]
```

The number of jobs is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the argument will not be used.

4.4.13.3 Install stage

The install stage invokes `make` with an `install` target:

```
make install
```

With the following environment variables set:

```
DESTDIR=<TARGET_DIR>
```

The `DESTDIR` path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `make install` may be invoked multiple times for each target it needs to install into.

If a package defines install options, the `install` target is not provided by default. Developers can override what target to invoke by adding it into the install options:

```
LIBFOO_INSTALL_OPTS = [
    'install-minimal',
]
```

The installation stage can be skipped by configuring `LIBFOO_MAKE_NOINSTALL`.

4.4.13.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.13.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.13.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.13.7 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.13.8 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.13.9 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.13.10 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.13.11 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.13.12 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.13.13 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # include the "install" target to the command
    'install': '',
    # adds "--option value" to the command
    '--option': 'value',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # include the "install" target to the command
    'install',
    # adds "--some-option" to the command
    '--some-option',
]
```

Defining custom install options will prevent the default `install` target from being added. Users looking to utilize the `install` target for the install stage with custom arguments should explicitly include the `install` target in their options.

4.4.13.14 LIBFOO_MAKE_NOINSTALL

Specifies whether a make package should skip an attempt to invoke the install target. Ideally, projects will have an `install` target configured to define how a project will install files into a target (or staging) environment. Not all make projects may have this target defined, which can cause the installation stage for a package to fail. A developer can specify this no-install flag to skip a make install target request and manage installation actions through other means (such as post-processing). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_MAKE_NOINSTALL = True
```

4.4.14 Meson package

Added in version 0.16.

A Meson package provides support for processing a Meson supported module.

```
LIBFOO_TYPE = 'meson'
```

During the configuration stage of a Meson package, `meson setup` will be invoked to generate build files for the module. For the build stage, `meson compile` will invoke the generated build files. For the installation stage (if enabled), `meson install` will be used. Each stage can be configured to manipulate environment variables and options used by Meson.

The default configuration built for projects is `debugoptimized`. A developer can override this option by explicitly adjusting the configuration option `LIBFOO_MESON_BUILD_TYPE` to, for example, `debug`:

```
LIBFOO_MESON_BUILD_TYPE = 'debug'
```

The following shows the default arguments used in stages and outlines configuration options that are available for a Meson package to set. See also the Meson package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.14.1 Configuration stage

The configuration stage invokes `meson` with the arguments:

```
meson setup \
    --buildtype debugoptimized \
    -Dcmake_prefix_path=<SYSROOT_PATHS> \
    -Dlibdir=lib \
    -Dpkg_config_path=<SYSROOT_PKGCFG_PATHS> \
    -Dprefix=<PREFIX> \
    -Dwrap_mode=nodownload \
    <BUILD_OUTPUT_DIR>
```

The build type is configured by `LIBFOO_MESON_BUILD_TYPE`.

The build output directory is configured to `PKG_BUILD_OUTPUT_DIR`.

Paths may vary based on how the package's `LIBFOO_INSTALL_TYPE` is configured. System root paths provided will only include the staging directory if `staging` is configured. Both the staging and target directories are provided is the `target` is configured. Likewise with the host directory if `host` is configured. pkg-config paths are defined to `<sysroot>/lib/pkgconfig`.

If `LIBFOO_PREFIX` resolves to an empty prefix, the `-Dprefix` define is not provided.

In the event that a package is reconfigured (e.g. `<pkg>-reconfigure`), the `--reconfigure` argument will also be included.

4.4.14.2 Build stage

The build stage invokes `meson` with the arguments:

```
meson compile -C <BUILD_OUTPUT_DIR> --jobs <NJOBS>
```

The `-C` directory is configured to `PKG_BUILD_OUTPUT_DIR`.

The number of jobs is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the argument will not be used.

4.4.14.3 Install stage

The install stage invokes `meson` with the arguments:

```
meson install -C <BUILD_OUTPUT_DIR> --destdir <TARGET_DIR> --no-rebuild
```

With the following environment variables set:

```
DESTDIR=<TARGET_DIR>
```

The `-C` directory is configured to `PKG_BUILD_OUTPUT_DIR`.

The `--destdir` argument and `DESTDIR` environment path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `meson install` may be invoked multiple times for each target it needs to install into.

The installation stage can be skipped by configuring `LIBFOO_MESON_NOINSTALL`.

4.4.14.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.14.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.14.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.14.7 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.14.8 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.14.9 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.14.10 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.14.11 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "-Doption=value" to the command
    'option': 'value',
}
```

4.4.14.12 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.14.13 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.14.14 LIBFOO_MESON_BUILD_TYPE

Added in version 2.7.

Specifies the build type used for the Meson package. A package may use a Meson-supported build type (`plain`, `debug`, `debugoptimized`, `release` or `minsize`). A developer needing to use a specific build type can configure this option with the name of the configuration. By default, the `debugoptimized` build type is used for all Meson packages.

```
LIBFOO_MESON_BUILD_TYPE = 'debugoptimized'
```

See also `default_meson_build_type`.

4.4.14.15 LIBFOO_MESON_NOINSTALL

Specifies whether the Meson package should skip an attempt to invoke the install command. Ideally, projects will have an install options configured to define how a project will install files into a target (or staging) environment. Not all Meson projects have installation options configured, or there can be cases where installation stage for a package to fail due to issues with some host environments. A developer can specify this no-install flag to skip a Meson-driven install request and manage installation actions through other means (such as post-processing). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_MESON_NOINSTALL = True
```

4.4.15 Python package

A Python package provides support for processing a Python supported module.

```
LIBFOO_TYPE = 'python'
```

Only the build and installation phases are used when processing the sources for a Python package (i.e. no configuration stage is invoked). The `LIBFOO_PYTHON_SETUP_TYPE` configuration dictates which build approach is performed for a package. The installation stage for all Python packages uses the `installer` module. When a Python package is processed, it will use the same Python interpreter used by releng-tool.

> **Note**
>
> For environments where releng-tool has been installed using `pipx`, a user will need to install any required build backend desired using the `pipx inject` command. For example, packages requiring Flit can install the build backend for their isolated environment using:
>
> ```
> pipx inject releng-tool flit-core
> ```

A developer can override what Python interpreter to use by configuring the `LIBFOO_PYTHON_INTERPRETER` option in a package:

```
LIBFOO_PYTHON_INTERPRETER = '/opt/my-custom-python-build/python'
```

The following shows the default arguments used in a package's build stage based on the configured setup type and outlines options that are available for a Python package to set. See also the Python package examples

4.4.15.1 Flit build stage

The build stage invokes Python with the `flit_core.wheel` module and arguments:

```
python -m flit_core.wheel
```

4.4.15.2 Hatch build stage

The build stage invokes Python with the `hatch` module and arguments:

```
python -m hatch --no-interactive build --target wheel
```

4.4.15.3 PDM build stage

The build stage invokes Python with the `pdm` module and arguments:

```
python -m pdm --ignore-python build --no-isolation --no-sdist
```

4.4.15.4 PEP 517 build stage

The build stage invokes Python with the `build` module and arguments:

```
python -m build --no-isolation --wheel
```

4.4.15.5 Poetry build stage

The build stage invokes Python with the `poetry` module and arguments:

```
python -m poetry build --no-interaction
```

4.4.15.6 Setuptools build stage

The build stage invokes Python with the `setup.py` file and arguments:

```
python setup.py --no-user-cfg bdist_wheel
```

However, if `setup.py` does not exist, the `setuptools` module will be imported and `setup()` will be triggered:

```
python -c "import setuptools; setuptools.setup()" --no-user-cfg bdist_wheel
```

4.4.15.7 distutils build stage

The build stage invokes Python with the `setup.py` file and arguments:

```
python setup.py --no-user-cfg bdist_wheel
```

4.4.15.8 `LIBFOO_BUILD_DEFS`

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.15.9 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.15.10 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.15.11 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.15.12 LIBFOO_INSTALL_DEFS

Removed in version 2.0: No longer applicable as all Python packages are installed using the `installer` module.

4.4.15.13 LIBFOO_INSTALL_ENV

Removed in version 2.0: No longer applicable as all Python packages are installed using the `installer` module.

4.4.15.14 LIBFOO_INSTALL_OPTS

Removed in version 2.0: No longer applicable as all Python packages are installed using the `installer` module.

4.4.15.15 LIBFOO_PYTHON_DIST_PATH

Added in version 2.0.

Changed in version 2.2: Support added for path-like values.

When a Python package is built, it will scan the `dist/` directory in package's output directory for a wheel package. It is possible for some Python packages to configure their projects to output built wheels into an alternative path. If an alternative path is configured, releng-tool will fail to find and install the package.

This option informs releng-tool what container folder hosts the provided wheel package. For example, if the Python package configures itself to output into `build/dist`, the following configuration can be used:

```
LIBFOO_PYTHON_DIST_PATH = 'build/dist'
```

4.4.15.16 LIBFOO_PYTHON_INSTALLER_INTERPRETER

Added in version 2.3.

Configures the interpreter path to use when generating launcher scripts when installing a Python package. This is passed into `installer` which handles the creations of launchers for an application (if a given Python package defines project scripts).

The default interpreter used for project scripts is as follows:

Type	Value
Non-Windows	`/usr/bin/python`
Windows	`python.exe`

An example using a custom interpreter `/opt/custom/python` for project scripts can be done using:

```
LIBFOO_PYTHON_INSTALLER_INTERPRETER = '/opt/custom/python'
```

Which should generate project scripts with a shebang:

```
#!/opt/custom/python
...
```

Before the introduction of this variable, the interpreter used would be configured to the same interpreter used by releng-tool.

4.4.15.17 LIBFOO_PYTHON_INSTALLER_LAUNCHER_KIND

Added in version 2.0.

Defines the launcher-kind to build when generating any executable scripts defined in the Python package's project configuration (`pyproject.toml`). By default, the launcher-kind is chosen based on the host platform building the package. Supported options are dictated by `installer`. Options may include:

- `posix`
- `win-amd64`
- `win-arm64`
- `win-arm`
- `win-ia32`

For example, to explicitly build POSIX executable scripts, the following configuration can be defined:

```
LIBFOO_PYTHON_INSTALLER_SCHEME = 'posix'
```

4.4.15.18 LIBFOO_PYTHON_INSTALLER_SCHEME

Added in version 2.0.

Defines the installation scheme used for Python packages. By default, releng-tool uses the following scheme entries:

Path	Installation directory
data	`prefix`
include	`prefix/include/python`
platinclude	`prefix/include/python`
platlib	`prefix/lib/python`
platstdlib	`prefix/lib/python`
purelib	`prefix/lib/python`
scripts	`prefix/bin`
stdlib	`prefix/lib/python`

A package can be configured with a scheme `native` to use the default install target based on the native system:

```
LIBFOO_PYTHON_INSTALLER_SCHEME = 'native'
```

Packages can also use schemes supported by Python's `sysconfig` module. For example:

```
LIBFOO_PYTHON_INSTALLER_SCHEME = 'posix_prefix'
```

A package may also define a custom scheme:

```
LIBFOO_PYTHON_INSTALLER_SCHEME = {
    'data':        '',
    'include':     'include/python',
    'platinclude': 'include/python',
    'platlib':     'lib/python',
    'platstdlib':  'lib/python',
    'purelib':     'lib/python',
    'scripts':     'bin',
```

(continues on next page)

(continued from previous page)

```
    'stdlib':       'lib/python',
}
```

4.4.15.19 LIBFOO_PYTHON_INTERPRETER

Changed in version 2.2: Support added for path-like values.

Defines a specific Python interpreter when processing the build and installation stages for a package. If not specified, the system's Python interpreter will be used. This field is optional.

```
LIBFOO_PYTHON_INTERPRETER = '<path>'
```

4.4.15.20 LIBFOO_PYTHON_SETUP_TYPE

Added in version 0.13.

Changed in version 0.14: Support added for `poetry`.

Changed in version 2.0: Use of `installer` is required for all package types.

Deprecated since version 2.0: Support for `distutils` packages is deprecated.

The setup type will configure how a Python package is built and installed. The default setup type used for a Python package is a distutils package. It is recommended to always configure a setup type for a Python package. The following outlines available setup types in releng-tool:

Type	Value
Flit	`flit`
Hatch	`hatch`
PDM	`pdm`
PEP 517 build	`pep517`
Poetry	`poetry`
Setuptools	`setuptools`
distutils	`distutils` (default)

For example:

```
LIBFOO_PYTHON_SETUP_TYPE = 'setuptools'
```

Host environments are required to pre-install needed packages in their running Python environment to support setup types not available in a standard Python distribution. For example, if a PDM setup type is set, the host system will need to have `pdm` Python module installed on the system.

The `installer` module will be used to install packages to their destination folders. For Setuptools/distutils packages, ensure `wheel` is available to help build as packages will be built with `bdist_wheel`.

4.4.16 SCons package

Added in version 0.13.

A SCons package provides support to easily invoke SCons commands at various stages of a package.

```
LIBFOO_TYPE = 'scons'
```

SCons-based projects by default will invoke the default target during the build stage, and invoke the `install` alias for the installation stage.

The following shows the default arguments used in stages and outlines configuration options that are available for a SCons package to set. See also the SCons package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.16.1 Configuration stage

Default configurations for SCons packages will not run a configuration stage. However, if a user wants to run a specific target during this stage, a target can be added into the configuration options. For example, if the package has a target `prework` that should be invoked during the configuration stage, the following can be used:

```
LIBFOO_CONF_OPTS = [
    'prework',
]
```

Which will invoke `scons` with the arguments:

```
scons -Q prework
```

Alternatively, if no configuration options are specified, a `<package>-configure` script can be invoked if available.

4.4.16.2 Build stage

The build stage invokes `scons` with the arguments:

```
scons -Q --jobs=<NJOBS>
```

This will trigger the default target for the SCons configuration. Developers can configure a specific target to invoke during the build stage by specifying a `LIBFOO_BUILD_OPTS` configuration. For example, if a package uses the target `release` for standard release builds, the following can be used:

```
LIBFOO_BUILD_OPTS = [
    'release',
]
```

The number of jobs is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the argument will not be used.

4.4.16.3 Install stage

The install stage invokes `scons` with an `install` target:

```
scons -Q install
```

With the following variables set:

```
DESTDIR=<TARGET_DIR>
PREFIX=<PREFIX>
```

The `DESTDIR` path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `scons install` may be invoked multiple times for each target it needs to install into.

The prefix argument is configured to `LIBFOO_PREFIX`.

If a package defines install options, the `install` target is not provided by default. Developers can override what target to invoke by adding it into the install options:

```
LIBFOO_INSTALL_OPTS = [
    'install-minimal',
]
```

The installation stage can be skipped by configuring `LIBFOO_SCONS_NOINSTALL`.

4.4.16.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.16.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.16.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.16.7 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.16.8 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.16.9 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.16.10 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.16.11 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.16.12 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.16.13 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # include the "install" target to the command
    'install': '',
    # adds "--option value" to the command
    '--option': 'value',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # include the "install" target to the command
    'install',
    # adds "--some-option" to the command
    '--some-option',
]
```

Defining custom install options will prevent the default `install` target from being added. Users looking to utilize the `install` target for the install stage with custom arguments should explicitly include the `install` target in their options.

4.4.16.14 LIBFOO_SCONS_NOINSTALL

Specifies whether a SCons package should skip an attempt to invoke the install alias. Ideally, projects will have an install alias defined to specify how a project will install files into a target (or staging) environment. Not all SCons projects may have this target defined, which can cause the installation stage for a package to fail. A developer can specify this no-install flag to skip a SCons install target request and manage installation actions through other means (such as post-processing). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_SCONS_NOINSTALL = True
```

4.4.17 Waf package

Added in version 2.8.

A Waf package provides support to easily invoke Waf commands at various stages of a package.

```
LIBFOO_TYPE = 'waf'
```

During the configuration stage of a Waf package, `waf configure` will be invoked to prepare a build. For the build stage, `waf build` will invoke the build event. For the installation stage (if enabled), `waf install` will be used. Each stage can be configured to manipulate environment variables and options used by Waf.

The following shows the default arguments used in stages and outlines configuration options that are available for a Waf package to set. See also the Waf package examples. All stages are invoked with a `PKG_BUILD_DIR` working directory.

4.4.17.1 Configuration stage

The configuration stage invokes `waf` with the arguments:

```
waf configure \
    --bindir=bin \
    --libdir=lib \
    --out=<BUILD_OUTPUT_DIR> \
    --prefix=<PREFIX>
```

The prefix arguments are configured to `LIBFOO_PREFIX`.

The build output directory is configured to `PKG_BUILD_OUTPUT_DIR`.

4.4.17.2 Build stage

The build stage invokes `waf` with the arguments:

```
waf build --jobs <NJOBS>
```

The number of jobs is populated by either the `--jobs` argument, `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS`. Although, if the configuration results in a single job, the argument will not be used.

4.4.17.3 Install stage

The install stage invokes `waf` with an `install` target:

```
waf install --destdir <TARGET_DIR>
```

With the following environment variables set:

```
DESTDIR=<TARGET_DIR>
```

The `--destdir` argument and `DESTDIR` environment path will be set to the target sysroot the package should install into (see also `LIBFOO_INSTALL_TYPE`). `waf install` may be invoked multiple times for each target it needs to install into.

The installation stage can be skipped by configuring `LIBFOO_WAF_NOINSTALL`.

4.4.17.4 LIBFOO_BUILD_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the build process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_BUILD_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.17.5 LIBFOO_BUILD_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the build process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_BUILD_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.17.6 LIBFOO_BUILD_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the build process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the build event. This field is optional.

```
LIBFOO_BUILD_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_BUILD_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.17.7 LIBFOO_CONF_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the configuration process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_CONF_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.17.8 LIBFOO_CONF_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the configuration process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_CONF_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.17.9 LIBFOO_CONF_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the configuration process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the configuration event. This field is optional.

```
LIBFOO_CONF_OPTS = {
    # adds "--option value" to the command
    '--option': 'value',
    # adds "--flag" to the command
    '--flag': '',
}

# (or)

LIBFOO_CONF_OPTS = [
    # adds "--some-option" to the command
    '--some-option',
]
```

4.4.17.10 LIBFOO_ENV

Added in version 0.17.

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into all stages for a package. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.17.11 LIBFOO_INSTALL_DEFS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass definitions into the installation process. This option can is defined as a dictionary of string pairs. This field is optional.

```
LIBFOO_INSTALL_DEFS = {
    # adds "--option=value" to the command
    '--option': 'value',
}
```

4.4.17.12 LIBFOO_INSTALL_ENV

Changed in version 2.2: Support added for path-like values.

Provides a means to pass environment variables into the installation process. This option is defined as a dictionary with key-value pairs where the key is the environment name and the value is the environment variable's value. This field is optional.

```
LIBFOO_INSTALL_ENV = {
    'OPTION': 'VALUE',
}
```

4.4.17.13 LIBFOO_INSTALL_OPTS

Changed in version 2.2: Support added for path-like values.

Provides a means to pass command line options into the installation process. This option can be defined as a dictionary of string pairs or a list with strings – either way defined will generate argument values to include in the installation event. This field is optional.

```
LIBFOO_INSTALL_OPTS = {
    # include the "install" target to the command
    'install': '',
    # adds "--option value" to the command
    '--option': 'value',
}

# (or)

LIBFOO_INSTALL_OPTS = [
    # include the "install" target to the command
    'install',
    # adds "--some-option" to the command
    '--some-option',
]
```

Defining custom install options will prevent the default `install` target from being added. Users looking to utilize the `install` target for the install stage with custom arguments should explicitly include the `install` target in their options.

4.4.17.14 LIBFOO_WAF_NOINSTALL

Specifies whether the Waf package should skip an attempt to invoke the install command. Ideally, projects can support an install invoke to help install files into a target (or staging) environment. Not all Waf projects may support an install stage, or there can be cases where installation stage for a package to fail due to issues with some host environments. A developer can specify this no-install flag to skip a Waf-driven install request and manage installation actions through other means (such as post-processing). By default, the installation stage is invoked with a value of `False`.

```
LIBFOO_WAF_NOINSTALL = True
```

4.4.18 Package hacking

Package types may define various command line defines and options to help support certain features or practices that best fit with releng-tool's staged processing. In some advanced scenarios, developers may wish to override these defines/options due to corner cases or preferences. Developers can perform overrides by hinting in configurations for things to remove.

For example, Make-based packages will include a `PREFIX` variable assignment based on the project's or package's configured prefix. This can result in the following installation command to be invoked:

```
make DESTDIR=<output>/target install PREFIX=/usr
```

If the assignment of `PREFIX` causes issues for a package, a developer can hint to remove such an option by configuring `LIBFOO_INSTALL_DEFS` to be as follows:

```
LIBFOO_INSTALL_DEFS = {
    'PREFIX': None,
}
```

This will then result in the following installation command for the package:

```
make DESTDIR=<output>/target install
```

Overrides are typically support on each configuration, build and install-related configurations. Not all defines/options can be overridden. As such overrides are advanced, developers are recommended to refer to the implementation for specifics. Developers can also use the `--debug` argument to see explicit commands invoked:

```
releng-tool --debug
```

4.4.19 Deprecated package options

The following outlines deprecated configuration options for packages. It is not recommended to use these options.

4.4.19.1 LIBFOO_DEPENDENCIES

Deprecated since version 1.3: Packages should use `LIBFOO_NEEDS` instead.

List of package dependencies a given project has. If a project depends on another package, the package name should be listed in this option. This ensures releng-tool will process packages in the proper order. The following shows an example package `libfoo` being dependent on `liba` and `libb` being processed first:

```
LIBFOO_DEPENDENCIES = [
    'liba',
    'libb',
]
```

4.4.19.2 LIBFOO_SKIP_REMOTE_CONFIG

Deprecated since version 1.3: Packages should use `LIBFOO_REMOTE_CONFIG` instead.

Flag value to indicate that a package should not attempt to load any package configurations which may be defined in the package's source. A package, by default, has the ability to load configuration information from a package's source. If the package includes a `.releng-tool` file at the root of their sources, supported configuration options that have not been populated will be registered into the package before invoking a package's configuration stage.

```
LIBFOO_SKIP_REMOTE_CONFIG = True
```

See also `releng.disable_remote_configs` quirk.

4.4.19.3 LIBFOO_SKIP_REMOTE_SCRIPTS

Deprecated since version 1.3: Packages should use `LIBFOO_REMOTE_SCRIPTS` instead.

Flag value to indicate that a package should not attempt to load any package scripts which may be defined in the package's source. Typically, a script-based package will load configuration, build, etc. scripts from its package definition folder. If a script-based package is missing a stage script to invoke and finds an associated script in the package's source, the detected script will be invoked. For example, if `libfoo.rt` package may attempt to load a `libfoo-configure.rt` script for a configuration stage. In the event that the script cannot be found and remote scripting is permitted for a package, the script (if exists) `releng-configure.rt` will be loaded from the root of the package's contents.

```
LIBFOO_SKIP_REMOTE_CONFIG = True
```

See also `releng.disable_remote_scripts` quirk.

4.5 Post-processing

Warning

A post-processing script (if used) will be invoked each time `releng-tool` reaches the final stage of a build.

Prospect

At this time, releng-tool supports only post-build scripts. It is planned to introduced support for some image-related helpers (i.e. package helpers). This may introduce a reserved `releng-tool-post-image.rt` script in future releases.

After each package has been processed, a project has the ability to perform post-processing. Post-processing allows a developer to cleanup the target directory, build an archive/package from generated results and more. If a project contains a `releng-tool-post-build.rt` inside the root directory, the post-processing script will be invoked in the final stage of a build.

A developer may start out with the following post-processing script `<root>/releng-tool-post-build.rt`:

```
└── my-releng-tool-project/
    ├── package/
    │   └── ...
    ├── releng-tool.rt
    └── releng-tool-post-build.rt     <----
```

With the contents:

```
print('post processing...')
```

The above script will output the newly inserted print message at the end of a build process:

```
$ releng-tool
...
generating license information...
post processing...
(success) completed (0:01:30)
```

A developer can take advantage of environment variables and script helpers for additional support.

It is important to note that post-processing scripts will be invoked each time a `releng-tool` invoke reaches the final stage of a build. A developer should attempt to implement the post-processing scripts in a way that it can be invoked multiple times. For example, if a developer decides to move a file out of the target directory into an interim directory when building an archive, it is most likely that a subsequent request to build may fail since the file can no longer be found inside the target directory.

4.6 Script helpers

releng-tool provides a series of helper functions which can be used in script-based packages, post-processing and more. Helper functions provided are listed below:

4.6.1 Available functions

`releng_tool.`**`debug`**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a debug message to standard out with a trailing new line. By default, debug messages will not be output to standard out unless the instance is configured with debugging enabled.

```
debug('this is a debug message')
```

Parameters

- **`msg`** – the message
- **`*args`** – an arbitrary set of positional and keyword arguments used when generating a formatted message

See also the `--debug` argument.

`releng_tool.`**`err`**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs an error message to standard error with a trailing new line and (if enabled) a red colorization.

```
err('this is an error message')
```

Parameters

- **`msg`** – the message
- **`*args`** – an arbitrary set of positional and keyword arguments used when generating a formatted message

`releng_tool.`**`hint`**(*msg: str*, **args*)

Added in version 0.13.

Changed in version 1.4: Ensure availability in script helpers.

Changed in version 2.7: Provided message will now expand variables.

Logs a hint message to standard out with a trailing new line and (if enabled) a cyan colorization.

```
hint('this is a hint message')
```

Parameters

- **`msg`** – the message
- **`*args`** – an arbitrary set of positional and keyword arguments used when generating a formatted message

releng_tool.**log**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a (normal) message to standard out with a trailing new line.

```
log('this is a message')
```

Parameters

- **msg** – the message
- ***args** – an arbitrary set of positional and keyword arguments used when generating a formatted message

releng_tool.**note**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a notification message to standard out with a trailing new line and (if enabled) an inverted colorization.

```
note('this is a note message')
```

Parameters

- **msg** – the message
- ***args** – an arbitrary set of positional and keyword arguments used when generating a formatted message

releng_tool.**releng_cat**(*file: str | bytes | PathLike*, **args: str | bytes | PathLike*) → bool

Added in version 0.11.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided file will now expand variables.

Attempts to read one or more files provided to this call. For each file, it will be read and printed out to the standard output.

An example when using in the context of script helpers is as follows:

```
releng_cat('my-file')
```

Parameters

- **file** – the file
- ***args** (*optional*) – additional files to include

Returns

`True` if all the files exists and were printed to the standard output; `False` if one or more files could not be read

releng_tool.**releng_copy**(*src: str | bytes | PathLike*, *dst: str | bytes | PathLike*, ** (Keyword-only parameters separator (PEP 3102))*, *quiet: bool = False*, *critical: bool = True*, *dst_dir: bool | None = None*, *nested: bool = False*) → bool

Changed in version 0.12: Add support for `dst_dir`.

Changed in version 1.4: Add support for `nested`.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided paths will now expand variables.

This call will attempt to copy a provided file, directory's contents or directory itself (if `nested` is `True`); defined by `src` into a destination file or directory defined by `dst`. If `src` is a file, then `dst` is considered to be a file or directory; if `src` is a directory, `dst` is considered a target directory. If a target directory or target file's directory does not exist, it will be automatically created. In the event that a file or directory could not be copied, an error message will be output to standard error (unless `quiet` is set to `True`). If `critical` is set to `True` and the specified file/directory could not be copied for any reason, this call will issue a system exit (`SystemExit`).

An example when using in the context of script helpers is as follows:

```
# (stage)
# my-file
releng_copy('my-file', 'my-file2')
# (stage)
# my-file
# my-file2
releng_copy('my-file', 'my-directory/')
# (stage)
# my-directory/my-file
# my-file
# my-file2
releng_copy('my-directory/', 'my-directory2/')
# (stage)
# my-directory/my-file
# my-directory2/my-file
# my-file
# my-file2
```

Parameters

- **src** – the source directory or file
- **dst** – the destination directory or file* (*if `src` is a file)
- **quiet** (*optional*) – whether or not to suppress output
- **critical** (*optional*) – whether or not to stop execution on failure
- **dst_dir** (*optional*) – force hint that the destination is a directory
- **nested** (*optional*) – nest a source directory into the destination

Returns

`True` if the copy has completed with no error; `False` if the copy has failed

Raises

SystemExit – if the copy operation fails with `critical=True`

`releng_tool.`**`releng_copy_into`**(*src: str | bytes | PathLike*, *dst: str | bytes | PathLike*, ***, *quiet: bool = False*, *critical: bool = True*, *nested: bool = False*) → bool

Added in version 0.13.

Changed in version 1.4: Add support for `nested`.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided paths will now expand variables.

This call will attempt to copy a provided file, directory's contents or directory itself (if `nested` is `True`); defined by `src` into a destination directory defined by `dst`. If a target directory does not exist, it will be automatically created. In the event that a file or directory could not be copied, an error message will be output to standard error (unless `quiet` is set to `True`). If `critical` is set to `True` and the specified file/directory could not be copied for any reason, this call will issue a system exit (`SystemExit`).

An example when using in the context of script helpers is as follows:

```
# (stage)
# my-file
releng_copy_into('my-file', 'my-directory')
# (stage)
# my-directory/my-file
# my-file
releng_copy_into('my-directory', 'my-directory2')
# (stage)
# my-directory/my-file
# my-directory2/my-file
# my-file
releng_copy_into('my-directory', 'my-directory3', nested=True)
# (stage)
# my-directory/my-file
# my-directory2/my-file
# my-directory3/directory/my-file
# my-file
```

Parameters

- **src** – the source directory or file
- **dst** – the destination directory
- **quiet** (*optional*) – whether or not to suppress output
- **critical** (*optional*) – whether or not to stop execution on failure
- **nested** (*optional*) – nest a source directory into the destination

Returns

`True` if the copy has completed with no error; `False` if the copy has failed

Raises

SystemExit – if the copy operation fails with `critical=True`

`releng_tool.`**`releng_define`**(*var*, *default=None*)

Added in version 2.7.

Ensures a provided variable is defined in the caller's global context. If not, the variable will be defined with the provided default value.

An example when using in the context of script helpers is as follows:

```
val = releng_define('MY_DEFINE', 'default-value')
print(val)
# (or)
releng_define('MY_DEFINE', 'default-value')
print(MY_DEFINE)
```

Parameters

- **var** – the define/variable name
- **default** (*optional*) – the default value to use if the define is not set

Returns
the set value for this define

`releng_tool.`**`releng_env`**(*key*, *value=<object object>*, ***, *overwrite=True*)

Added in version 0.3.

Changed in version 2.9: Support the `overwrite` argument.

Provides a caller a simple method to fetch or configure an environment variable for the current context. This call is the same as if one directly fetched from or managed a key-value with `os.environ`. If `value` is not provided, the environment variable's value (if set) will be returned. If `value` is set to a value of `None`, any set environment variable will be removed. A caller can also set `overwrite=False` to avoid overwriting an already configured environment variable.

An example when using in the context of script helpers is as follows:

```
# get an environment variable
value = releng_env('KEY')

# set an environment variable
releng_env('KEY', 'VALUE')

# set an environment variable if it is not already set
releng_env('KEY', 'VALUE', overwrite=False)
```

Parameters

- **key** – the environment key
- **value** (*optional*) – the environment value to set
- **overwrite** (*optional*) – whether to overwrite an environment variable

Returns
the value of the environment variable

`releng_tool.`**`releng_execute`**(*args*, *cwd=None*, *env=None*, *env_update=None*, *quiet=None*, *critical=True*, *poll=False*, *capture=None*, *expand=True*, *args_str=False*, *ignore_stderr=False*)

Changed in version 1.13: Add support for `expand`.

Changed in version 1.14: Add support for `args_str`.

Changed in version 2.0: Add support for `ignore_stderr`.

Runs the command described by `args` until completion. A caller can adjust the working directory of the executed command by explicitly setting the directory in `cwd`. The execution request will return `True` on a successful execution; `False` if an issue has been detected (e.g. bad options or called process returns a non-zero value). In the event that the execution fails, an error message will be output to standard error unless `quiet` is set to `True`.

The environment variables used on execution can be manipulated in two ways. First, the environment can be explicitly controlled by applying a new environment content using the `env` dictionary. Key of the dictionary will be used as environment variable names, whereas the respective values will be the respective environment variable's value. If `env` is not provided, the existing environment of the executing context will be used. Second,

a caller can instead update the existing environment by using the `env_update` option. Like `env`, the key-value pairs match to respective environment key-value pairs. The difference with this option is that the call will use the original environment values and update select values which match in the updated environment request. When `env` and `env_update` are both provided, `env_update` will be updated the options based off of `env` instead of the original environment of the caller.

If `critical` is set to `True` and the execution fails for any reason, this call will issue a system exit (`SystemExit`). By default, the critical flag is enabled (i.e. `critical=True`).

A caller may wish to capture the provided output from a process for examination. If a list is provided in the call argument `capture`, the list will be populated with the output provided from an invoked process.

An example when using in the context of script helpers is as follows:

```
releng_execute(['echo', '$TEST'], env={'TEST': 'this is a test'})
```

Parameters

- **`args`** – the list of arguments to execute
- **`cwd`** (*`optional`*) – working directory to use
- **`env`** (*`optional`*) – environment variables to use for the process
- **`env_update`** (*`optional`*) – environment variables to append for the process
- **`quiet`** (*`optional`*) – whether or not to suppress output (defaults to `False`)
- **`critical`** (*`optional`*) – whether or not to stop execution on failure (defaults to `True`)
- **`poll`** (*`optional`*) – obsolete/ignored argument
- **`capture`** (*`optional`*) – list to capture output into
- **`expand`** (*`optional`*) – perform variable expansion on arguments
- **`args_str`** (*`optional`*) – invoke arguments as a single string
- **`ignore_stderr`** (*`optional`*) – ignore any stderr output

Returns

`True` if the execution has completed with no error; `False` if the execution has failed

Raises

`SystemExit` – if the execution operation fails with `critical=True`

`releng_tool.`**`releng_execute_rv`**(*command*, **args*, ***kwargs*)

Added in version 0.8.

Changed in version 1.13: Add support for `expand`.

Changed in version 1.14: Add support for `args_str`.

Changed in version 2.0: Add support for `ignore_stderr`.

Runs the command `command` with provided `args` until completion. A caller can adjust the working directory of the executed command by explicitly setting the directory in `cwd`. The execution request will return the command's return code as well as any captured output.

The environment variables used on execution can be manipulated in two ways. First, the environment can be explicitly controlled by applying a new environment content using the `env` dictionary. Key of the dictionary will be used as environment variable names, whereas the respective values will be the respective environment variable's value. If `env` is not provided, the existing environment of the executing context will be used. Second, a caller can instead update the existing environment by using the `env_update` option. Like `env`, the key-value

pairs match to respective environment key-value pairs. The difference with this option is that the call will use the original environment values and update select values which match in the updated environment request. When `env` and `env_update` are both provided, `env_update` will be updated the options based off of `env` instead of the original environment of the caller.

An example when using in the context of script helpers is as follows:

```
rv, out = releng_execute_rv('echo', '$TEST', env={'TEST': 'env-test'})
```

Parameters

- **command** – the command to invoke
- ***args** (*optional*) – arguments to add to the command
- ****cwd** – working directory to use
- ****env** – environment variables to use for the process
- ****env_update** – environment variables to append for the process
- ****expand** – perform variable expansion on arguments
- ****args_str** – invoke arguments as a single string
- ****ignore_stderr** – ignore any stderr output

Returns

the return code and output of the execution request

`releng_tool.`**releng_exists**(*path: str | bytes | PathLike*, **args: str | bytes | PathLike*) → bool

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided path will now expand variables.

Allows a caller to verify the existence of a file on the file system. This call will return `True` if the path exists; `False` otherwise.

An example when using in the context of script helpers is as follows:

```
if releng_exists('my-file'):
    print('the file exists')
else:
    print('the file does not exist')
```

Parameters

- **path** – the path
- ***args** (*optional*) – additional components of the file

Returns

`True` if the path exists; `False` otherwise

`releng_tool.`**releng_exit**(*msg: str | None = None*, *code: int | None = None*)

Changed in version 2.7: Provided message will now expand variables.

Provides a convenience method to help invoke a system exit call without needing to explicitly use `sys`. A caller can provide a message to indicate the reason for the exit. The provide message will output to standard error. The exit code, if not explicit set, will vary on other arguments. If a message is provided to this call, the default exit

code will be `1`. If no message is provided, the default exit code will be `0`. In any case, if the caller explicitly sets a code value, the provided code value will be used.

An example when using in the context of script helpers is as follows:

```
releng_exit('there was an error performing this task')
```

Parameters

- **msg** (*optional*) – error message to print
- **code** (*optional*) – exit code; defaults to 0 if no message or defaults to 1 if a message is set

Raises

SystemExit – always raised

`releng_tool.`**releng_expand**(*obj*, *kv=None*)

This expand utility method will attempt to expand variables in detected string types. For a detected string which contains substrings in the form of `$value` or `${value}`, these substrings will be replaced with their respective key-value (if provided) or environment variable value. For substrings which do not have a matching variable value, the substrings will be replaced with an empty value. If a dictionary is provided, keys and values will be checked if they can be expanded on. If a list/set is provided, each value which be checked if it can be expanded on. If a dictionary key is expanded to match another key, a key-value pair can be dropped. If a set may result in a smaller set if expanded values result in duplicate entries.

An example when using in the context of script helpers is as follows:

```
import os
...

os.environ['MY_ENV'] = 'my-environment-variable'
value = releng_expand('$MY_ENV')
print(value)
# will output: my-environment-variable
```

Parameters

- **obj** – the object
- **kv** (*optional*) – key-values pairs to use

Returns

the expanded object

`releng_tool.`**releng_include**(*file_path: str | bytes | PathLike*, *, *source: bool = False*) → None

Added in version 0.12.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided file path will now expand variables.

Changed in version 2.7: Introduce the `source` argument.

The provided call will execute code at the provided file path. The path will be relative to the caller's script, unless an absolute path is provided. The executed script will be initialized with globals matching the caller's script.

An example when using in the context of script helpers is as follows:

```
# load "my-other-script" found alongside the current script
releng_include('my-other-script')
```

Changes to the global context can be imported into the caller's context by enabling the `source` argument. For example:

```
# script "my-var-script" defines "HELLO='world'"
releng_include('my-var-script', source=True)
# prints "world"
print(HELLO)
```

Parameters

- **file_path** – the script to invoke
- **source** (*optional*) – import globals into invoking script

`releng_tool.`**`releng_join`**(*path: str | bytes | PathLike*, **paths: str | bytes | PathLike*)

An alias for `os.path.join`. See also https://docs.python.org/library/os.path.html#os.path.join.

`releng_tool.`**`releng_ls`**(*dir_: str | bytes | PathLike*, *, *recursive: bool = False*) → bool

Added in version 0.11.

Changed in version 2.0: Add support for `recursive`.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided directory will now expand variables.

Attempts to read a directory for its contents and prints this information to the configured standard output stream.

An example when using in the context of script helpers is as follows:

```
releng_ls('my-dir/')
```

Parameters

- **dir** – the directory
- **recursive** (*optional*) – recursive search of entries

Returns

`True` if the directory could be read and its contents have been printed to the standard output; `False` if the directory could not be read

`releng_tool.`**`releng_mkdir`**(*dir_: str | bytes | PathLike*, **args: str | bytes | PathLike*, ***kwargs*) → None | Path

Added in version 0.3.

Changed in version 0.13: Add support for `critical`.

Changed in version 1.3: Accepts multiple paths components.

Changed in version 1.3: Returns the created path.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided directory will now expand variables.

Attempts to create the provided directory. If the directory already exists, this method has no effect. If the directory does not exist and could not be created, this method will return `None`. Also, if an error has been detected, an error message will be output to standard error (unless `quiet` is set to `True`).

An example when using in the context of script helpers is as follows:

```
if releng_mkdir('my-directory'):
    print('directory was created')
else:
    print('directory was not created')

target_dir = releng_mkdir(TARGET_DIR, 'sub-folder')
if target_dir:
    # output] target directory: <target>/sub-folder
    print('target directory:', target_dir)
else:
    print('directory was not created')
```

Parameters

- **dir** – the directory
- ***args** (*optional*) – additional components of the directory
- ****quiet** (*optional*) – whether or not to suppress output (defaults to `False`)
- ****critical** (*optional*) – whether or not to stop execution on failure (defaults to `False`)

Returns

the directory that exists; `None` if the directory could not be created

`releng_tool.`**`releng_move`**(*src: str | bytes | PathLike*, *dst: str | bytes | PathLike*, *, *quiet: bool = False*, *critical: bool = True*, *dst_dir: bool | None = None*, *nested: bool = False*) → bool

Changed in version 0.14: Add support for `dst_dir`.

Changed in version 1.4: Add support for `nested`.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided paths will now expand variables.

This call will attempt to move a provided file, directory's contents or directory itself (if `nested` is `True`); defined by `src` into a destination file or directory defined by `dst`. If `src` is a file, then `dst` is considered to be a file or directory; if `src` is a directory, `dst` is considered a target directory. If a target directory or target file's directory does not exist, it will be automatically created.

In the event that a file or directory could not be moved, an error message will be output to standard error (unless `quiet` is set to `True`). If `critical` is set to `True` and the specified file/directory could not be moved for any reason, this call will issue a system exit (`SystemExit`).

An example when using in the context of script helpers is as follows:

```
# (input)
# my-directory/another-file
# my-file
# my-file2
releng_move('my-file', 'my-file3')
releng_move('my-directory/', 'my-directory2/')
releng_move('my-file2', 'my-directory2/')
# (output)
# my-directory2/another-file
# my-directory2/my-file2
# my-file3
```

Parameters

- **src** – the source directory or file
- **dst** – the destination directory or file* (*if `src` is a file)
- **quiet** (*optional*) – whether or not to suppress output
- **critical** (*optional*) – whether or not to stop execution on failure
- **dst_dir** (*optional*) – force hint that the destination is a directory
- **nested** (*optional*) – nest a source directory into the destination

Returns

`True` if the move has completed with no error; `False` if the move has failed

Raises

SystemExit – if the copy operation fails with `critical=True`

`releng_tool.`**releng_move_into**(*src: str | bytes | PathLike*, *dst: str | bytes | PathLike*, ***, *quiet: bool = False*, *critical: bool = True*, *nested: bool = False*) → bool

Added in version 0.14.

Changed in version 1.4: Add support for `nested`.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided paths will now expand variables.

This call will attempt to move a provided file, directory's contents or directory itself (if `nested` is `True`); defined by `src` into a destination directory defined by `dst`. If a target directory directory does not exist, it will be automatically created.

In the event that a file or directory could not be moved, an error message will be output to standard error (unless `quiet` is set to `True`). If `critical` is set to `True` and the specified file/directory could not be moved for any reason, this call will issue a system exit (`SystemExit`).

An example when using in the context of script helpers is as follows:

```
# (input)
# my-directory/another-file
# my-directory2/another-file2
# my-file
# my-file2
releng_move_into('my-file', 'my-file3')
releng_move_into('my-directory', 'my-directory3')
releng_move_into('my-file2', 'my-directory3')
releng_move_into('my-directory2', 'my-directory3', nested=True)
# (output)
# my-directory3/my-directory2/another-file2
# my-directory3/another-file
# my-directory3/my-file2
# my-file3
```

Parameters

- **src** – the source directory or file
- **dst** – the destination directory
- **quiet** (*optional*) – whether or not to suppress output

- **critical** (*optional*) – whether or not to stop execution on failure
- **nested** (*optional*) – nest a source directory into the destination

Returns
`True` if the move has completed with no error; `False` if the move has failed

Raises
SystemExit – if the copy operation fails with `critical=True`

`releng_tool.`**releng_path**(**pathsegments*)

Added in version 2.3.

An alias for `pathlib.Path`. See also https://docs.python.org/3/library/pathlib.html#pathlib.Path.

`releng_tool.`**releng_register_path**(*dir_: str | bytes | PathLike*, *, *critical: bool = True*)

Added in version 2.7.

This call will register a provided path into the Python module search path (`sys.path`). This can be useful for situations when trying to load a local/relative folder containing extensions or other enhancements a developer wants to use/import. If `critical` is set to `True` and the specified directory could not be registered for any reason, this call will issue a system exit (`SystemExit`).

If the provided path is already registered, the call is ignored and will return as if a registration was made (`True`).

An example when using in the context of script helpers is as follows:

```
releng_register_path(ROOT_DIR.parent / 'my-other-folder')
```

Parameters

- **dir** – the directory to register
- **critical** (*optional*) – whether or not to stop execution on failure

Returns
`True` if the path has been registered; `False` if the registration has failed

Raises
SystemExit – if the registration fails with `critical=True`

`releng_tool.`**releng_remove**(*path: str | bytes | PathLike*, *quiet=False*) → bool

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided path will now expand variables.

Attempts to remove the provided path if it exists. The path value can either be a directory or a specific file. If the provided path does not exist, this method has no effect. In the event that a file or directory could not be removed due to an error other than unable to be found, an error message will be output to standard error (unless `quiet` is set to `True`).

An example when using in the context of script helpers is as follows:

```
releng_remove('my-file')
# (or)
releng_remove('my-directory/')
```

Parameters

- **path** – the path to remove

- **quiet** (*optional*) – whether or not to suppress output

Returns

`True` if the path was removed or does not exist; `False` if the path could not be removed from the system

`releng_tool.`**`releng_symlink`**(*target: str | bytes | PathLike*, *link_path: str | bytes | PathLike*, ***, *quiet: bool = False*, *critical: bool = True*, *lpd: bool = False*, *relative: bool = True*) → bool

> **Note**
>
> This call may not work in Windows environments if the user invoking releng-tool does not have permission to create symbolic links.

Added in version 1.4.

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided paths will now expand variables.

This call will attempt to create a symbolic link to a `target` path. A provided `link_path` determines where the symbolic link will be created. By default, the `link_path` identifies the symbolic link file to be created. However, if `lpd` is set to `True`, it will consider the `link_path` as a directory to create a symbolic link in. For this case, the resulting symbolic link's filename will match the basename of the provided `target` path.

If a symbolic link already exists at the provided link path, the symbolic link will be replaced with the new `target`. If the resolved link path already exists and is not a symbolic link, this operation will not attempt to create a symbolic link.

If the directory structure of a provided `link_path` does not exist, it will be automatically created. In the event that a symbolic link or directory could not be created, an error message will be output to standard error (unless `quiet` is set to `True`). If `critical` is set to `True` and the symbolic link could not be created for any reason, this call will issue a system exit (`SystemExit`).

An example when using in the context of script helpers is as follows:

```
# my-link -> my-file
releng_symlink('my-file', 'my-link')

# my-link -> container/my-file
releng_symlink('container/my-file', 'my-link')

# some/folder/my-link -> ../../my-file
releng_symlink('my-file', 'some/folder/my-link')

# my-file -> container/my-file
releng_symlink('my-file', 'container', ldp=True)

# some-path/my-link -> <workdir>/folder/my-file
releng_symlink('folder/my-file', 'some-path/my-link', relative=False)
```

Parameters

- **target** – the source path to link to
- **link_path** – the symbolic link path

- **quiet** (*optional*) – whether to suppress output
- **critical** (*optional*) – whether to stop execution on failure
- **lpd** (*optional*) – hint that the link is a directory to create in
- **relative** (*optional*) – whether to build a relative link

Returns
`True` if the symbolic link has been created; `False` if the symbolic link could not be created

Raises
SystemExit – if the symbolic link operation fails with `critical=True`

`releng_tool.`**releng_require_version**(*minver=None*, ***kwargs*)

Added in version 0.11.

Changed in version 2.0: Support maximum version.

Enables a caller to explicitly check for a required releng-tool version. Invoking this function with a dotted-separated `version` string, the string will be parsed and compared with the running releng-tool version. If the required version is met, this method will have no effect. In the event that the required version is not met, the exception `SystemExit` will be raised if the critical flag is set; otherwise this call will return `False`.

An example when using in the context of script helpers is as follows:

```
# ensure we are using releng-tool v1
releng_require_version('1.0.0')
```

Parameters

- **minver** – dotted-separated minimum version string
- ****quiet** (*optional*) – whether or not to suppress output
- ****critical** (*optional*) – whether or not to stop execution on failure
- ****maxver** (*optional*) – dotted-separated maximum version string

Returns
`True` if the version check is met; `False` if the version check has failed

Raises
SystemExit – if the version check fails with `critical=True`

`releng_tool.`**releng_tmpdir**(*dir_: str | bytes | PathLike | None = None*, **args: str | bytes | PathLike*, ***kwargs*) → Iterator[str]

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.2: Add support for `*args` and `**wd`.

Changed in version 2.7: Provided directory will now expand variables.

Creates a temporary directory in the provided directory `dir_` (or system default, is not provided). This is a context-supported call and will automatically remove the directory when completed. If the provided directory does not exist, it will created. If the directory could not be created, an `FailedToPrepareBaseDirectoryError` exception will be thrown.

An example when using in the context of script helpers is as follows:

```
with releng_tmpdir() as dir_:
    print(dir_)
```

Parameters

- **dir** (*optional*) – the directory to create the temporary directory in
- ****wd** (*optional*) – whether to use the temporary directory as the working directory (defaults to `False`)

Raises

FailedToPrepareBaseDirectoryError – the base directory does not exist and could not be created

`releng_tool.`**releng_touch**(*file: str | bytes | PathLike*, **args: str | bytes | PathLike*) → bool

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.2: Add support for `*args`.

Changed in version 2.7: Provided file will now expand variables.

Attempts to update the access/modifications times on a file. If the file does not exist, it will be created. This utility call operates in the same fashion as the `touch` system command.

An example when using in the context of script helpers is as follows:

```
if releng_touch('my-file'):
    print('file was created')
else:
    print('file was not created')
```

Parameters

- **file** – the file
- ***args** (*optional*) – additional components of the file

Returns

`True` if the file was created/updated; `False` if the file could not be created/updated

`releng_tool.`**releng_wd**(*dir_: str | bytes | PathLike*) → Iterator[str]

Changed in version 2.2: Accepts a str, bytes or os.PathLike.

Changed in version 2.7: Provided directory will now expand variables.

Moves the current context into the provided working directory `dir`. When returned, the original working directory will be restored. If the provided directory does not exist, it will created. If the directory could not be created, an `FailedToPrepareWorkingDirectoryError` exception will be thrown.

An example when using in the context of script helpers is as follows:

```
with releng_wd('my-directory/'):
    # invoked in 'my-directory'

# invoked in original working directory
```

Parameters

dir – the target working directory

Raises

FailedToPrepareWorkingDirectoryError – the working directory does not exist and could not be created

releng_tool.**success**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a success message to standard error with a trailing new line and (if enabled) a green colorization.

```
success('this is a success message')
```

Parameters

- **msg** – the message
- ***args** – an arbitrary set of positional and keyword arguments used when generating a formatted message

releng_tool.**verbose**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a verbose message to standard out with a trailing new line and (if enabled) an inverted colorization. By default, verbose messages will not be output to standard out unless the instance is configured with verbosity.

```
verbose('this is a verbose message')
```

Parameters

- **msg** – the message
- ***args** – an arbitrary set of positional and keyword arguments used when generating a formatted message

See also the `--verbose` argument.

releng_tool.**warn**(*msg: str*, **args*)

Changed in version 2.7: Provided message will now expand variables.

Logs a warning message to standard error with a trailing new line and (if enabled) a purple colorization.

```
warn('this is a warning message')
```

Parameters

- **msg** – the message
- ***args** – an arbitrary set of positional and keyword arguments used when generating a formatted message

Raises

RelengToolWarningAsError – when warnings-are-errors is configured

4.6.2 Available variables

The following variables are registered in the global context for any project or package definition/script.

4.6.2.1 releng_args

Changed in version 2.5: Variable no longer populated when `action-pkg-exec` is set.

> **Note**
>
> When using `<pkg>-exec "<cmd>"`, the `releng_args` variable will not be populated. This is to prevent conflicts from project-specific argument processing and package-specific run arguments.

A list of arguments forwarded into a releng-tool invoke. If a caller uses the `--` argument, all trailing arguments will be populated into "forwarded argument" list. A project may use these arguments for their own tailoring.

A user can use Python's `argparse` module to manage custom arguments. For example, if trying to add a new flag `--custom` to a build, the following can be added into a project's `releng-tool.rt` definition:

```
import argparse
parser = argparse.ArgumentParser()
parser.add_argument('--custom', action='store_true')
args = parser.parse_args(args=releng_args)
print(args.custom)
```

The flag can be enabled by invoking releng-tool using:

```
releng-tool -- --custom
```

4.6.2.2 `releng_version`

The version of releng-tool.

```
print(f'Using version {releng_version}')
```

4.6.3 Importing helpers

Scripts directly invoked by releng-tool will automatically have these helpers registered in the script's globals module (i.e. no import is necessary). If a project defines custom Python modules in their project and wishes to take advantage of these helper functions, the following import can be used to, for example, import a specific function:

```
from releng_tool import releng_execute
```

Or, if desired, all helper methods can be imported at once:

```
from releng_tool import *
```

4.7 Licenses

A releng-tool project can defined multiple packages, each with the possibility of having multiple licenses associated with them. Each project may vary: some may have only proprietary sources and may not care about tracking this information, some may only use open source software and require to populate license information for a final package, or a mix.

When license information is populated for a project, each project's license information (`LIBFOO_LICENSE_FILES`) is will be populated into a single license document. If a developer defines the `license_header` configuration, the generated document will be prefixed with the header content. For example, developers can create a new license header file `assets/license-header.tpl` in the project folder:

```
└── my-releng-tool-project/
    ├── assets/
    │   └── license-header.tpl        <----
    ├── package/
    │   └── ...
    └── releng-tool.rt
```

Which then `releng-tool.rt` can be configured to use the header contents:

```
import os

... (other configuration options)

license_header_file = ROOT_DIR / 'assets' / 'license-header.tpl'
license_header = license_header_file.read_text()
```

Licenses for a project are generated before the post-processing phase. This allows a developer to use generated license document(s) when preparing final archives/packages.

See also license generation.

4.8 Tips

The following contains a series of tips which may be helpful for a user:

4.8.1 Offline builds

A user can prepare for an offline build by using the `fetch` action:

```
releng-tool fetch
```

Package content will be downloaded into the respective `dl/` or `cache/` folders into the output directory. Future builds for the project should no longer need external access until these folders are removed.

> **Note**
>
> There are a few exceptions where offline builds may not function as expected.
>
> 1. If running in a development mode and a package definition defines a `LIBFOO_DEVMODE_IGNORE_CACHE` configuration, updated sources will be re-fetched each time.
> 2. If a developer defines a package definition or a post-build script which performs fetch-like calls (e.g. if custom files are downloaded when running a `libfoo-build` script), releng-tool will not stop the script from performing this request. Offline builds are only possible if developers define their projects in a way where fetching-like operations only occur during a fetch-stage.
> 3. If a package defines additional dependencies (e.g. Cargo packages), additional downloading may be required after an extraction phase. Users can use the `fetch-full` to help ensure all dependencies required for a build have been downloaded.

4.8.2 Parallel builds

A stage for a package (such as a build stage) can take advantage of multiple cores to perform the step. By default, releng-tool will attempt to run as many jobs for a stage equal to the amount of physical cores on the host system. The amount of jobs available for a stage can be configured using the `--jobs` argument. For example, if a user wishes to override the amount of jobs attempted for stages to two jobs, the following can be used:

```
releng-tool --jobs 2
```

If the total number of jobs provided is negative, it will subtract the provided value from the automatic job detection count (to a minimum of one). For example, to use one less job than normally used:

```
releng-tool --jobs -1
```

Note that a developer may adjust the amount of jobs allowed for a specific package if a package cannot support parallel processing using the `LIBFOO_FIXED_JOBS` or `LIBFOO_MAX_JOBS` package options.

4.8.3 Privileged builds

It is never recommended to invoke a build with elevated (e.g. root) privileges. A builder invoking in an elevated environment runs the risk of a misconfigured releng-tool project *dirtying or destroying* the builder's host environment.

releng-tool will generate a warning when an elevated run has been detected. For certain cases when using a container image that operates in a single-user mode, the image can define the environment variable `RELENG_IGNORE_RUNNING_AS_ROOT` to suppress these warnings.

4.8.4 License generation

At the end of a `releng-tool` invoke, the final stages will compile a list of package license information (if licenses are defined). If a user wishes to compile a project's list of license information without performing an entire build, the `licenses` action can be used:

```
releng-tool licenses
```

License information can then be found in the root directory's `<root>/licenses` folder.

4.8.5 Alternative extensions

Deprecated since version 2.0: The `.releng` extension is no longer recommended and will be removed in a future release.

Deprecated since version 2.2: Extensionless configurations/scripts are no longer recommended and may be removed in a future release.

Changed in version 2.2: Extension priority orders have changed (<2.2: *(none)*, `.rt`, `.releng`, `.py`; >=2.2: `.rt`, `.py`, *(none)*, `.releng`).

A default configuration file is typically a file named `releng-tool.rt` at the root of a project. Consider the following example of a project with a `libfoo` package with various stage scripts:

```
└── my-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.rt
    │       ├── libfoo-build.rt
    │       └── libfoo-install.rt
    └── releng-tool.rt
```

Developers who do not prefer the `.rt` extension may use the `.py` extension. For example, the above example is equivalent to the structure:

```
└── my-project/
    ├── package/
    │   └── libfoo/
    │       ├── libfoo.py
    │       ├── libfoo-build.py
    │       └── libfoo-install.py
    └── releng-tool.py
```

For a specific file to be loaded, releng-tool uses the following priority:

1. File with a `.rt` extension
2. File with a `.py` extension
3. File without an extension (*deprecated*)
4. File with a `.releng` extension (*deprecated*)

Only the first detected file will be loaded. For example, if a project has multiple releng-tool configuration files with different extensions:

```
└── my-project/
    ├── package/
```

(continues on next page)

(continued from previous page)

```
    │   └── libfoo/
    │       └── ...
    ├── releng-tool.rt
    └── releng-tool.py
```

Only the `releng-tool.rt` configuration script will be used.

4.8.6 VCS Ignore

When invoking releng-tool on a project, the project's root directory will be populated with cached assets and other output files. A series of standard ignore patterns can be applied to a repository to prevent observing these generated files using VCS tools. The following is an example ignore configuration which can be applied for Git-based repositories (via `.gitignore`):

```
# releng-tool
/cache/
/dl/
/output/
.releng-flag-*
```

4.9 Advanced

The following contains a series of advanced guides which a developer may want to use for more involved use cases.

4.9.1 Patching

> **Note**
>
> Patches are ignored when in development mode by default for packages with a development revision, for `local` VCS packages or when in local-sources mode for internal packages.

Changed in version 2.9: Additional configuration modes to permit development revisions to have patches applied.

The patching stage for a package provides the ability for a developer to apply one or more patches to extracted sources. A project may take advantage of acquiring sources from one or more externally managed implementations. Fetched sources may not be able to build in a developer's releng-tool project due to limitations of the implementation or build scripts provided by the package. A developer can prepare a series of patches to apply to a package and submit changes upstream to correct the issue. However, the developer is then left to either wait for the changes to be merged in or needs to make a custom archive with the appropriate modifications already applied. To avoid this, a developer can include patches directly in the package folder to be automatically applied during patching stage.

When a package's patch stage is reached, releng-tool will look for patches found inside the package folder with the extension `.patch`. Patches found inside a package folder are applied in ascending order. It is recommended to prefix patch filenames with a numerical value for clarity. For example, the following package patches:

```
$ cd package/liba
$ ls *.patch
0001-accept-linker-flags.patch
0002-correct-output-path.patch
0003-support-disabling-test-build.patch
liba
liba.hash
```

With be applied in the following order:

1. `0001-accept-linker-flags.patch`
2. `0002-correct-output-path.patch`
3. `0003-support-disabling-test-build.patch`

If a user configures their build environment in development mode, patches will not be applied by default if a package defines a development revision. The idea is that a development revision is most likely the bleeding edge source of a package and does not need any patches. If a user configures their build environment in local-sources mode and a package is defined as internal, patches will not be applied to the sources. This is to prevent the patching system from making unexpected modifications to a developer's local sources.

In the scenario where a developer does want to override when patches are applied, there are a couple of advanced options. First, the option `LIBFOO_IGNORE_PATCHES` allows a developer to avoid the automatic application of patches on a package during normal runs. Second, the option `LIBFOO_DEVMODE_PATCHES` can be configured to permit a package to utilize patches in a development mode.

For example, the following configuration will instead only apply patches on a package when releng-tool is operating in a development mode and the package defines a development revision:

```
LIBFOO_DEVMODE_PATCHES = True
LIBFOO_IGNORE_PATCHES = True
```

4.9.2 Internal/external packages

Packages are either internal or external packages. All packages are considered external by default unless explicitly configured as internal through either a project configuration or a package option. Internal or external packages are treated the same except for the following:

- An internal package will not generate output warnings if the package is missing hash information or an ASCII-armor.
- An internal package will not generate output warnings if the package is missing licenses.
- When configured for local-sources mode, only internal packages which have local sources configured will have their fetch, extract and patch stages skipped.

An individual package can be configured as internal using `LIBFOO_INTERNAL`. For example:

```
LIBFOO_INTERNAL = True
```

Developers may want to instead use the project configuration `default_internal` to configure all packages as internal by default:

```
default_internal = True
```

See also `LIBFOO_EXTERNAL`.

4.9.3 Development mode

Development mode provides a way for a user to process packages using variant/development versions of sources rather than using fixed stable versions. A package will typically target a stable release, either pointing to a specific archive to download or a specific tag to clone from. However, for some builds, a user may wish to build a specific package against their main development branch (e.g. the `main` branch of a Git repository) or a long-term stable release branch. Packages can be defined to target these specific revisions if running in development mode.

To enable development mode, invoking `releng-tool` with the `--development` (or `-D`) argument will enable the mode. Future calls to releng-tool for the project will use a development revision for packages where appropriate. For example:

```
$ releng-tool --development [<mode>]
(success) configured root for development mode
$ releng-tool
~building against development sources~
...
```

Development mode is persisted through the use of a file flag in the root directory.

Consider the following example: a package defines multiple revisions to fetch sources from:

```
LIBFOO_SITE = 'https://example.com/libfoo.git'
LIBFOO_REVISION = {
    DEFAULT_REVISION: '1.2',
    'develop': 'main',
    'lts': '1.1.x',
}
```

Or an equivalent:

```
LIBFOO_SITE = 'https://example.com/libfoo.git'
LIBFOO_REVISION = {
    '*': '1.2',
    'develop': 'main',
    'lts': '1.1.x',
}
```

A build would normally use the `1.2` tag for this package. However, if an environment is configured to use the `develop` development mode:

```
$ releng-tool --development develop
 (or)
$ releng-tool -D develop
```

This package would use the `main` branch instead.

Projects can also target specific sites based off the development mode. This can be useful if a package uses a built archive for a stable release, but having development sources fetched from a repository. For example:

```
LIBFOO_SITE = {
    DEFAULT_SITE: 'https://pkgs.example.com/releases/libfoo-${LIBFOO_VERSION}.tar.gz',
    'test': 'https://git.example.com/libfoo.git',
}

LIBFOO_REVISION = {
    'test': 'main',
}
```

Or an equivalent:

```
LIBFOO_SITE = {
    '*': 'https://pkgs.example.com/releases/libfoo-${LIBFOO_VERSION}.tar.gz',
    'test': 'https://git.example.com/libfoo.git',
}

LIBFOO_REVISION = {
    'test': 'main',
}
```

In a normal execution, a tar.gz archive would be downloaded for the package. However, if an environment is configured to use the `test` development mode, sources will be fetched from the Git repository on the `main` branch.

Simple development modes are also supported. Packages can use the `LIBFOO_DEVMODE_REVISION` option to hint at a development revision to pull.

```
LIBFOO_DEVMODE_REVISION = 'main'
LIBFOO_REVISION = 'v3.0'
```

A build would normally use the `v3.0` tag for this package. However, if an environment is configured a non-explicit development mode:

```
$ releng-tool --development
```

This package would use the `main` branch instead.

A user can either disable development sources mode by:

- Providing a development mode of `-` or `unset`;
- Invoking `mrproper`; or,
- By manually removing the file flag found at the root of the project.

For example:

```
releng-tool --development unset
```

4.9.4 Local-sources mode

> **Note**
>
> Local-sources mode only applies to internally flagged packages.

> **Note**
>
> Clean events (such as `releng-tool clean`) will not touch packages using sources found alongside the output directory

Local-sources mode provides a way for a developer to build internal-flagged packages using sources found alongside the root directory (or a specific provided directory), instead of having releng-tool attempt to fetch them from remote instances. This is primarily for developers who desire to manually manage source content outside the releng-tool environment. Local-sources mode only applies to internally flagged packages. Consider the following example: a releng-tool project has a package called `liba`. When releng-tool is invoked in normal configurations, the package will do fetching, extraction and patching to prepare the directory `<root>/output/build/liba-<version>`. However, if a builder has configured the working root for local-sources mode, sources for `liba` will be used from the folder `<root>/../liba` instead:

```
├── liba/
│   └── ...
└── my-releng-tool-project/
    ├── package/
    │   └── liba/
    │       └── ...
    ├── LICENSE
    ├── README.md
    └── releng-tool.rt
```

When in local-sources mode, an internal package will skip the fetching, extraction and patching stages in order to prevent undesired manipulation of developer-prepared sources. Another consideration to note is the use of clean operators while in local-sources mode. Continuing with the above example, if a user invokes `releng-tool liba-clean`, the operation will not remove the `<root>/../liba` folder. Responsibility to managing a clean `liba` package will be left with the user.

To enable local-sources mode, invoking `releng-tool` with the `--local-sources` (or `-L`) argument will enable the mode. Future calls to releng-tool for the project will use local sources for packages defined as internal packages. For example:

```
$ releng-tool --local-sources
(*) <parent>
(success) configured root for local-sources mode
$ releng-tool
~building against local sources~
...
```

Local-sources mode is persisted through the use of a file flag in the root directory.

If a user provides a directory for the `--local-sources` argument, packages will be looked for in the provided folder instead of the parent of the configured root directory. For example:

```
$ releng-tool --local-sources ~/workdir2
(*) ~/workdir2
(success) configured root for local-sources mode
$ releng-tool
~building against local sources~
...
```

In the above example, if a project had an internal package `liba`, sources for `liba` will be used from the folder `~/workdir2/liba`:

```
├── workdir/
│   └── my-releng-tool-project/
│       ├── package/
│       │   └── liba/
│       │       └── ...
│       ├── LICENSE
│       ├── README.md
│       └── releng-tool.rt
└── workdir2/
    └── liba/
        └── ...
```

Users can also provide package-specific overrides. If a user provides a path which is prefixed with a package's name with either a colon (`:`) or at sign (`@`), the sources for the provided package will be used from the respective folder:

```
$ releng-tool -L ~/workdir2
$ releng-tool -L libb:/mnt/sources/libb
$ releng-tool -L libc:
(*) ~/workdir2
(libb) /mnt/sources/libb
(libc) <unset>
(success) configured root for local-sources mode
$ releng-tool
~building against local sources~
...
```

In the above example, if a project had internal packages `liba`, `libb` and `libc`, the following paths will be used:

```
/
├── home/
│   └── <user>/
│       ├── workdir/
```

(continues on next page)

(continued from previous page)

```
|       |   └── my-releng-tool-project/
|       |       ├── package/
|       |       |   ├── liba/
|       |       |   |   └── ...
|       |       |   ├── libb/
|       |       |   |   └── ...
|       |       |   └── libc/
|       |       |       └── ...
|       |       ├── LICENSE
|       |       ├── README.md
|       |       └── releng-tool.rt
|       └── workdir2/
|           └── liba/
|               └── ...
└── mnt/
    ├── sources/
    |   └── libb/
    |       └── ...
    ...
```

- Sources for `liba` will be used from the folder `~/workdir2/liba`,
- Sources for `libb` will be used from the folder `/mnt/sources/libb`; and,
- Sources for `libc` will not be fetched locally.

A user can either disable local sources mode by:

- Providing a local-source path of `-` or `unset`;
- Invoking `mrproper`; or,
- By manually removing the file flag found at the root of the project.

For example:

```
releng-tool --local-sources unset
```

4.9.5 Profiles

Profiles provide a way to support tailoring the execution of a releng-tool run for select project requirements. A user can define a profile to enable by providing a `--profile` argument. A profile value can then be read by a project's configuration or various package stages to manipulate a run as desired. Note that releng-tool does not use any provided profile values other than normalizing profile strings to be forwarded to project/package scripts. For example, consider the following run that flags a profile named `awesome-mode`:

```
releng-tool --profile awesome-mode
```

A project configuration or package stage can then check the `RELENG_PROFILES` variable to determine if a conditional event should be performed. To continue with this example, if looking to add an additional package when using this profile, the following can be added in a project's `releng-tool.rt` file:

```
packages = [
    'example',
]
```

(continues on next page)

(continued from previous page)

```
if 'awesome-mode' in RELENG_PROFILES:
    packages.append('awesome-mods')
```

Multiple profiles can be provided as well:

```
releng-tool --profile awesome-mode --profile another-example
 (or)
releng-tool --profile awesome-mode,another-example
 (or)
releng-tool --profile "awesome-mode;another-example"
```

The script environment provides a list of known profiles. However, if reading the environment variable `RELENG_PROFILES`, note that if more than one profile is defined, the environment string will be semicolon-separated values. Considering the above example, the environment variable would be populated as follows:

```
awesome-mode;another-example
```

Profile names are normalized when processed by releng-tool. A profile value will replace special characters with dashes and will lowercase the resulting value. The following shows an example of normalized profile names that are all equivalent:

- `red-backed-shrike` (normalized form)
- `Red_Backed_Shrike`
- `Red Backed Shrike`

4.9.6 Configuration overrides

Deprecated since version 2.0: The use of a `releng-overrides` script is deprecated. Various override capabilities noted below can either be supported in a `releng-tool.rt` configuration or have alternative approaches to performing overrides.

If a builder needs to (for example) override a tool location or package site, a user can define either environment options or setup a configuration override script `releng-overrides`:

```
└── my-releng-tool-project/
    ├── package/
    │   └── ...
    ├── LICENSE
    ├── README.md
    ├── releng-tool.rt
    ├── releng-overrides     <-- an override script
    ...
```

It is never recommended to persist a configuration overrides file into a project's source repository. Overrides are intended for dealing with specific hosts (e.g. injecting overrides when running with legacy build images).

4.9.6.1 Extraction tool overrides

See `override_extract_tools`.

4.9.6.2 Revision overrides

Deprecated since version 2.0: The use of revision overrides is deprecated. Users wanting to override revisions without source modification are recommended to use variable injection.

The `override_revisions` option inside a configuration override script allows a dictionary to be provided to map a package name to a new revision value. Consider the following example: a project defines `module-a` and `module-b` packages with package `module-b` depending on package `module-a`. A developer may be attempting to tweak package `module-b` on the fly to test a new capabilities against the current stable version of `module-a`. However, the developer does not want to explicitly change the revision inside package `module-b`'s definition. To avoid this, an override can be used instead:

```
override_revisions = {
    'module-b': '<test-branch>',
}
```

The above example shows that package `module-b` will fetch using a test branch instead of what is defined in the actual package definition.

4.9.6.3 Site overrides

Deprecated since version 2.0: The use of site overrides is deprecated. Users wanting to override sites without source modification are recommended to use variable injection.

The `override_sites` option inside a configuration override script allows a dictionary to be provided to map a package name to a new site value. There may be times where a host may not have access to a specific package site. To have a host to use a mirror location without having to adjust the package definition, the site override option can be used. For example, consider a package pulls from site `git@example.com:myproject.git`. However, the host `example.com` cannot be access from the host machine. If a mirror location has been setup at `git@example.org:myproject.git`, the following override can be used:

```
override_sites = {
    '<package-name>': 'git@example.org:myproject.git',
}
```

4.9.6.4 Tool overrides

See Environment — Tool overrides.

4.9.7 Quirks

releng-tool also provides a series of configuration quirks to change the default running state of a run. This can be used to help manage rare host environment scenarios where releng-tool may be experiencing issues.

4.9.7.1 Command line quirks

Quirks for a run can be enabled through the command line. releng-tool accepts `--quirk <quirk-id>` argument, for example:

```
releng-tool --quirk releng.some_quirk_id
```

If multiple quirks are desired, the quirk argument can be provided multiple times:

```
releng-tool --quirk releng.quirk1 --quirk releng.quirk2
```

Configuration quirks do not persist and need to be utilized each run of releng-tool.

4.9.7.2 Configuration-driven quirks

Quirks can also be enabled through the project configuration. For example, the following can be used to enable one or more quirks for a releng-tool run:

```
quirks = [
    'releng.quirk1',
    'releng.quirk2',
    ...
]
```

4.9.7.3 Available quirks

The following is a list of all available quirks supported by releng-tool:

4.9.7.3.1 Quirk `releng.bzr.certifi`

When a package is configured to fetch bzr sources, select environments may have issues attempting to download from Launchpad (or other hosting) due to legacy certificates.

> See `bzr help ssl.ca_certs` for how to specify trusted CA certificates.
> Pass `-Ossl.cert_reqs=none` to disable certificate verification entirely.

If a user's environment has `certifi` installed, a user can invoke releng-tool with the quirk `releng.bzr.certifi` enabled to use certifi's certificates instead. For example:

```
releng-tool --quirk releng.bzr.certifi
```

See also

- GNU Bazaar
- GNU Bazaar (The Wayback Machine)
- Quirks

4.9.7.3.2 Quirk `releng.cmake.disable_direct_includes`

For CMake-based projects, releng-tool will populate a series of include directories (internally or from a project's configuration definition) to configure a CMake project with. These include paths will be populated into the `CMAKE_INCLUDE_PATH` option when generating native build scripts.

In addition to `CMAKE_INCLUDE_PATH`, releng-tool will also populate multiple language type's `CMAKE_<LANG>_STANDARD_INCLUDE_DIRECTORIES` as well. This registers convenient include paths for languages (e.g. C/C++), avoiding the need for project definitions to explicitly configure common include paths in host, staging or target areas.

However, if this causes issues for a build environment (such as when building a CMake project with a toolchain file which has issues with standard include overrides), the option can be disabled using the `releng.cmake.disable_direct_includes` quirk:

```
releng-tool --quirk releng.cmake.disable_direct_includes
```

See also

- CMAKE_<LANG>_STANDARD_INCLUDE_DIRECTORIES
- CMAKE_INCLUDE_PATH
- Quirks

4.9.7.3.3 Quirk `releng.cmake.disable_parallel_option`

Deprecated since version 1.0: This quirk is no longer applicable. CMake parallelization is now driven internally using the CMAKE_BUILD_PARALLEL_LEVEL environment variable.

When releng-tool invokes a build stage for a CMake project, the `--parallel` argument is used to trigger multiple jobs for a build. If running on a host system running a version/variant of CMake which do not explicitly provide the parallelization option, the build may fail. Users to enable the `releng.cmake.disable_parallel_option` quirk to prevent this option from being used:

```
releng-tool --quirk releng.cmake.disable_parallel_option
```

See also

- Quirks

4.9.7.3.4 Quirk `releng.disable_devmode_ignore_cache`

Added in version 2.4.

Packages may be configured with LIBFOO_DEVMODE_IGNORE_CACHE to always attempt a new fetch of sources for a development-configured revision. However, if a remote is not available during a rebuild event, the process will fail since the package cannot be re-fetched from the configured site. To help a builder hint that using the cache is fine for an invoke, this quirk can be provided to avoid any re-fetch attempt.

```
releng-tool --quirk releng.disable_devmode_ignore_cache
```

See also

- Quirks

4.9.7.3.5 Quirk `releng.disable_local_site_warn`

Added in version 1.4.

Deprecated since version 2.5: This quirk is no longer applicable. releng-tool will no longer generate a warning when using a local package.

Users can create packages using a local site for initial development and testing scenarios. However, using local sites is not recommended for long-term use; hence a warning is generated when releng-tool runs. While the warning aims to promote a user to move the package into their own site of some sort (e.g. Git), a user may be good enough with using a specific package as a local one. For such cases, using this quirk can prevent any warnings generated when a local site is used.

```
releng-tool --quirk releng.disable_local_site_warn
```

See also

- Quirks

4.9.7.3.6 Quirk `releng.disable_prerequisites_check`

A releng-tool project may require various dependencies. For example, if a package define a Git-based site for sources, the `git` client will be required to clone these sources into a build directory. To help inform users of issues in the early stage of a build, releng-tool will perform a prerequisites check for certain dependencies. If a prerequisite cannot be found, the build process stops immediately.

In select scenarios, the prerequisite check may wish to be skipped. For example, if the running environment is not expected to perform a specific action in a project that requires an application. To avoid triggering a run error at start, users may set the `releng.disable_prerequisites_check` quirk to skip any prerequisite check:

```
releng-tool --quirk releng.disable_prerequisites_check
```

See also

- Quirks

4.9.7.3.7 Quirk `releng.disable_remote_configs`

releng-tool package sources have the ability to inject late-stage configuration options from a remote source. If a user is having issues with a project's remote options for a package, the `releng.disable_remote_configs` quirk can be used to skip any application of late-stage configuration options:

```
releng-tool --quirk releng.disable_remote_configs
```

See also

- Quirks

4.9.7.3.8 Quirk `releng.disable_remote_scripts`

releng-tool package sources have the ability to define configuration, build and installation stage scripts from a remote source. If a user is having issues with a project's remote scripts for a package, the `releng.disable_remote_scripts` quirk can be used to skip any invoke of these scripts:

```
releng-tool --quirk releng.disable_remote_scripts
```

See also

- Quirks

4.9.7.3.9 Quirk `releng.disable_spdx_check`

Deprecated since version 2.9: This quirk is no longer applicable. SPDX license checks are now handled by the lint action.

When package definitions are being processed, any license configurations will be checked to see if they conform with SPDX license identifiers. If not, a warning will be generated.

If a user wishes to ignore all SPDX license warnings, the `releng.disable_spdx_check` quirk can be used:

```
releng-tool --quirk releng.disable_spdx_check
```

See also

- Quirks
- SPDX license identifiers

4.9.7.3.10 Quirk `releng.disable_verbose_patch`

Added in version 2.2.

When utilizing patching capabilities in releng-tool, all patches are by default applied with a `--verbose` argument. If this is not preferred by a project, this quirk can be set to omit the argument.

```
releng-tool --quirk releng.disable_verbose_patch
```

See also

- Patching
- Quirks

4.9.7.3.11 Quirk `releng.git.no_depth`

releng-tool may use the `--depth` option for Git-based packages to to perform shallow checkouts to improve fetch performance. If a user does not want to perform shallow checkouts, the `releng.git.no_depth` quirk may be used.

```
releng-tool --quirk releng.git.no_depth
```

See also

- Git clone's `--depth` option
- Quirks

4.9.7.3.12 Quirk `releng.git.no_quick_fetch`

When fetching sources for a Git-site-defined package, releng-tool will attempt to acquire these sources by only pulling applicable revision references needed for a build (i.e. "quick fetching", in the context of releng-tool). For example, if a project defines a Git tag to fetch, only the `refs/tags/<tag>` reference will be fetched.

If a user does not want to utilizing quick-fetching for Git packages, this can be disabled by using the `releng.git.no_quick_fetch` quirk.

```
releng-tool --quirk releng.git.no_quick_fetch
```

See also

- Quirks

4.9.7.3.13 Quirk `releng.git.replicate_cache`

Added in version 0.17.

When fetching sources for a Git-site-defined package, releng-tool will keep a project's Git repository inside a cache folder and use the project's build directory as the Git work-tree. When extracting a given revision for a project, releng-tool will also attempt to setup a `.git` file to point to the cache directory, if users want to perform Git-related commands (typically, only for unique development/testing scenarios).

In the case where developers want a complete copy of the Git repository in the build folder instead of a pointer to the cache, the `releng.git.replicate_cache` quirk can be enabled to force releng-tool to copy over the Git repository when a package is extracted.

```
releng-tool --quirk releng.git.replicate_cache
```

See also

- Quirks

4.9.7.3.14 Quirk `releng.ignore_failed_extensions`

Added in version 2.7.

For projects that configure extensions, if an extension fails to load (either missing or a bad extension definition), the releng-tool process will stop with an error.

If a user wants to ignore the failed loading of extension for a given run, they may do so by configuring the `releng.ignore_failed_extensions` quirk.

```
releng-tool --quirk releng.ignore_failed_extensions
```

See also

- Quirks

4.9.7.3.15 Quirk `releng.log.execute_args`

Added in version 1.4.

When releng-tool is configured with `--debug`, the tool will log (among other things) process executions. Debugging can print information such as working directory of an execution, as well as arguments used for a call. For some commands, the command line and arguments can be long and may be difficult to quickly scan for issues. To help improve the user experience, the `releng.log.execute_args` quick can be used to print each argument on their own line.

```
releng-tool --debug --quirk releng.log.execute_args
```

See also

- Quirks

4.9.7.3.16 Quirk `releng.log.execute_env`

Added in version 1.3.

When releng-tool is configured with `--debug`, the tool will log (among other things) process executions. Debugging can print information such as working directory of an execution, as well as arguments used for a call. The environment for an execution is not logged by default. For users wishing to include this information as well before an invoked process, the `releng.log.execute_env` quick can be used.

```
releng-tool --debug --quirk releng.log.execute_env
```

See also

- Quirks

4.9.7.3.17 Quirk `releng.stats.no_pdf`

releng-tool will generate statistics for a build (such as the duration it takes to build a specific package) and place this information in the output directory. If an environment has Matplotlib installed, PDF-format statistics may be generated for a more visual inspection of this information.

If a user does not want PDF statistics to be created, the quirk `releng.stats.no_pdf` can be used:

```
releng-tool --quirk releng.stats.no_pdf
```

See also

- Matplotlib
- Quirks

4.10 Extensions

Changed in version 2.7: releng-tool will now stop if an extension fails to load.

Changed in version 2.7: releng-tool projects can define a `releng_setup` hook in their project configurations to perform similar actions as extensions can.

A releng-tool project can use an extension by registering the extension name in the `extensions` configuration option inside the project configuration (`releng`). For example, to load an extension `my_awesome_extension` into releng-tool, the following can be defined:

```
extensions = [
    'my_awesome_extension',
]
```

During the initial stages of a releng-tool process, the process will check and load any configured extension. In the event that an extension is missing, is unsupported for the running releng-tool version or fails to load; a detailed error message will be presented to the user.

Extensions are typically Python packages installed for the running Python environment. If extensions are not packaged/installed, users can alternatively append the location of an extension implementation into the system path in the releng-tool configuration file. For example, if a user has a releng-tool project checked out alongside a checked out extension in a folder named `my-awesome-extension`, the extension's path can be registered into the system path using the following:

```
releng_register_path(ROOT_DIR.parent / 'my-awesome-extension')
```

While the ability to load extensions is supported, capabilities provided by extensions are not officially supported by releng-tool. For issues related to specific extension use, it is recommended to see the documentation provided by the providers of said extensions.

For developers interesting in implementing extensions, a list of available API interfaces and documentation for these interfaces can be found inside the API implementation. Implementation in the API folder aims to be "API safe" – there is a strong attempt to prevent the changing of classes, methods, etc. to prevent compatibility issues as both releng-tool and extensions (if any) evolve.

Advanced users may also register application hooks by defining a `releng_setup` hook in their project's `releng-tool.rt` configuration. For example:

```
def releng_setup(app):
    ...
```

4.10.1 Examples

The following provides a series of examples for developers on how to develop extensions for releng-tool:

4.10.1.1 Making a custom post-build action extension

This is an extension example for the following use case:

> After performing a build for any of my releng-tool projects, I want to automatically add a series of files into the output directory before we attempt to package the contents. I want to do this using an extension to avoid the need to repeat the process across all my releng-tool projects.

4.10.1.1.1 Prelude

- This extension example uses the name `my-awesome-extension`. Developers are free to change this with whatever name is applicable for their own extension.
- This tutorial does not cover steps on publishing an extension to an index such as PyPI. Instead, steps will be provided to load a extension's sources into the system path for releng-tool (which is optional whenever a given extension can be installed from an index or runs in an environment that already manages the installation of the extension).

4.10.1.1.2 Creating the post-build action extension

A first step is to setup the initial file structure for the extension. Assuming there exists a checked out releng-tool project (`my-releng-tool-project`) to be tested against, create a new extension folder named `my-awesome-extension` alongside the releng-tool project(s):

```
├── my-awesome-extension/
│   ├── my_awesome_extension/
│   │   ├── assets/
│   │   │   └── NOTICE.pdf
│   │   └── __init__.py
│   ├── LICENSE
│   ├── README.md
│   ...
└── my-releng-tool-project/
```

Inside this folder, create any base documents desired, a sample PDF, as well as preparing a `my_awesome_extension` Python package folder to hold the extension implementation. For the `__init__.py` file, add the following contents:

```
import os
import shutil

def releng_setup(app):
    app.connect('post-build-finished', my_awesome_postbuild_handler)

def my_awesome_postbuild_handler(env):
    print('post-build triggered!')
```

The above adds a function `releng_setup`, which releng-tool uses to register the extension into the releng-tool engine. The function is invoked during initialization by passing an application context (`app`) which the extension can use to hook onto events and more. This extension implements a function `my_awesome_postbuild_handler`, which is registered on the `post-build-finished` event. This allows the handler to be triggered when a post-build stage has completed for a project.

To test that the post-build event is triggered, use an existing releng-tool project and register this new example extension into the releng-tool process:

```
import os
import sys

...

extensions = [
    'my_awesome_extension',
]
```

(continues on next page)

(continued from previous page)

```
# add local extension path into system path
releng_register_path(ROOT_DIR.parent / 'my-awesome-extension')
```

When running releng-tool, the following message should be printed at the end of a run:

```
$ releng-tool
...
post-build triggered!
(success) completed (0:00:00)
```

Next, we can now adjust our handler to help modify the output directory when the event is triggered. In this example, we want to copy an extension-managed `NOTICE.pdf` file and place it into the output directory. Update the extension with the following:

```
def my_awesome_postbuild_handler(env):
    # find the NOTICE PDF document
    notice_pdf = ROOT_DIR / 'assets' / 'NOTICE.pdf'

    # copy this file into the target directory
    target = TARGET_DIR / 'NOTICE.pdf'
    releng_copy(notice_pdf, target)
```

With this change, a re-run of the releng-tool project should have the `NOTICE.pdf` document copied into the target directory for the project.

This concludes this tutorial.

For a list of available API interfaces and documentation for these interfaces, see the documentation found inside the API implementation.

4.10.1.2 Making a custom package type extension

This is an extension example for the following use case:

> I'm using several packages in a project which use a custom package type (i.e. they are not a typical Autotools or CMake project). I want to have an extension so that I can trigger custom prepare and build actions for project that is downloaded from version control.

4.10.1.2.1 Prelude

- This extension example uses the name `my-awesome-extension`. Developers are free to change this with whatever name is applicable for their own extension.
- This tutorial does not cover steps on publishing an extension to an index such as PyPI. Instead, steps will be provided to load a extension's sources into the system path for releng-tool (which is optional whenever a given extension can be installed from an index or runs in an environment that already manages the installation of the extension).

This tutorial assumes the existence of an already prepared releng-tool project, which had one or more packages planned to use a newly introduced package type. The package type operates as follows:

- A repository will have a `prepare` script at its root, to be run before any builds are triggered.
- For builds, a `build` script exists at the root, which expects a type of build (e.g. `release` or `debug`) to be passed as an argument.

- There is no standard installation script/process to perform.

The example extension below will be designed to handle the above package type requirements.

4.10.1.2.2 Creating a custom package type extension

Initial skeleton

A first step is to setup the initial file structure for the extension. Assuming there exists a checked out releng-tool project (`my-releng-tool-project`) to be tested against, create a new extension folder named `my-awesome-extension` alongside the releng-tool project:

```
├── my-awesome-extension/
│   ├── my_awesome_extension/
│   │   ├── __init__.py
│   │   └── MyAwesomePackageType.py
│   ├── LICENSE
│   ├── README.md
│   ...
└── my-releng-tool-project/
```

Inside this folder, create any base documents desired as well as preparing a `my_awesome_extension` Python package folder to hold the extension implementation. For the `__init__.py` file, add the following contents:

```
from my_awesome_extension import mapt

def releng_setup(app):
    app.add_package_type('ext-mapt', mapt.MyAwesomePackageType)
```

The above adds a function `releng_setup`, which releng-tool uses to register the extension into the releng-tool engine. The function is invoked during initialization by passing an application context (`app`) which the extension can use to hook onto events and more.

This extension registers a new package type `ext-mapt`. When this new package type is registered into releng-tool, the `MyAwesomePackageType` class definition will be created/used to handle various stages of a package.

> **Note**
>
> All extension package types must be prefixed with `ext-`.

For `MyAwesomePackageType.py`, add the following contents:

```
class MyAwesomePackageType:
    def configure(self, name, opts):
        print('TODO -- configure stage:', name)
        return True

    def build(self, name, opts):
        print('TODO -- build stage:', name)
        return True

    def install(self, name, opts):
        # do nothing for installation
        return True
```

The above package type provides a skeleton implementation for the pending configuration and build stages for this new package type. The installation stage is also required, but will only return `True` since it is not required for this package type example.

Initial testing

To test that the new package type is triggered at desired stages, use an existing releng-tool project and register this new example extension into the releng-tool process:

```
import os
import sys

...

extensions = [
    'my_awesome_extension',
]

# add local extension path into system path
releng_register_path(ROOT_DIR.parent / 'my-awesome-extension')
```

Next, we will create/update a package which will use this new type. For example, for a `libfoo` package, we will configure the package type to `ext-mapt` and track a custom extension option `mapt-build-type` with a value of `release` (which we can later use to forward to our build script).

```
LIBFOO_SITE = 'https://example.com/libfoo.git'
LIBFOO_TYPE = 'ext-mapt'

LIBFOO_EXTOPT = {
    'mapt-build-type': 'release',
}
```

When running releng-tool, the following messages should be printed during a run:

```
$ releng-tool libfoo
patching libfoo...
configuring libfoo...
TODO -- configure stage: libfoo
building libfoo...
TODO -- build stage: libfoo
installing libfoo...
```

Implement the configuration stage

With the extension being triggered at expected locations, we can now provide implementation for these hooks to trigger the required `prepare` and `build` scripts. The following steps will edit the existing `MyAwesomePackageType.py` file.

First, add some utility calls for the upcoming implementation:

```
from releng_tool import releng_execute
from releng_tool import releng_exists
from releng_tool import releng_exit
from releng_tool import releng_join
```

(continues on next page)

(continued from previous page)

```
from releng_tool import verbose

# script shell to invoke
SHELL_BIN = 'sh'


class MyAwesomePackageType:
    ...
```

The above adds the following:

- `SHELL_BIN`: we define the shell executable to be invoked
- `releng_execute`: to be used to invoke our prepare/build scripts
- `releng_exists`: to help check if a package has expected scripts
- `releng_exit`: to help exit configure/build events on error
- `releng_join`: to help join paths for script targets
- `verbose`: some verbose message support to help development/error cases

Developers can use any supported Python packages/modules for this running environment, and this example uses a series of helper functions provided by releng-tool for convenience. Using releng-tool helper functions is not required if implementations wish to use another approach for their implementation.

We will implement the configuration event for our extension:

```
class MyAwesomePackageType:
    def configure(self, name, opts):
        verbose('invoking a mapt prepare for package: {}', name)
        prepare_script = releng_join(opts.build_dir, 'prepare')
        if not releng_exists(prepare_script):
            releng_exit('project is missing "prepare" script')

        return releng_execute([SHELL_BIN, prepare_script])

    ...
```

The above will:

- Trigger a verbose message (if releng-tool is running with `--verbose`).
- Build the `prepare` script path expected in the project's build directory.
- Verify that the script exists. If not, stop the configuration event.
- Execute the prepare shell script.

Implement the build stage

With the configuration stage completed, we will now implement the build stage:

```
class MyAwesomePackageType:
    ...

    def build(self, name, opts):
```

(continues on next page)

(continued from previous page)

```
        verbose('invoking a mapt build for package: {}', name)
        build_script = releng_join(opts.build_dir, 'build')
        if not releng_exists(build_script):
            releng_exit('project is missing "build" script')

        build_type = opts.ext.get('mapt-build-type')
        if not build_type:
            releng_exit('project is missing "mapt-build-type" option')

        return releng_execute([SHELL_BIN, build_script, build_type])
```

The above will:

- Trigger a verbose message (if releng-tool is running with `--verbose`).
- Build the `build` script path expected in the project's build directory.
- Verify that the script exists. If not, stop the build event.
- Extract the expected `mapt-build-type` option from the package definition. If the option does not exist, the build event will be stopped.
- Execute the build shell script.

Final testing

With the extension events implemented, re-run the releng-tool project from the package's configuration stage to see expected output:

```
$ releng-tool libfoo-reconfigure
configuring libfoo...
building libfoo...
installing libfoo...
```

Based on the package's `prepare` and `build` script, inspect the console output and build output to verify the respective scripts have performed their tasks.

This concludes this tutorial.

For a list of available API interfaces and documentation for these interfaces, see the documentation found inside the API implementation.

CHAPTER

FIVE

EXAMPLES

Tip

New developers may be interested in reading the tutorials section for step-by-step examples.

Tip

Developers wishing to quickly generate an initial project skeleton in their working directory can use the `init` action:

```
releng-tool init
```

A series of demonstration projects can be found in the following repository:

> releng-tool — Examples repository
> https://github.com/releng-tool/releng-tool-examples

5.1 Autotools package examples

An example Autotools package definition:

package/libfoo/libfoo.rt

```
LIBFOO_NEEDS = [
    'libbar',
]

LIBFOO_INSTALL_TYPE = 'staging'
LIBFOO_LICENSE = ['BSD-2-Clause']
LIBFOO_LICENSE_FILES = ['COPYING']
LIBFOO_SITE = 'https://www.example.com/download/libfoo-1.2.4.tar.xz'
LIBFOO_TYPE = 'autotools'
LIBFOO_VERSION = '1.2.4'

LIBFOO_CONF_ENV = {
    'PKG_CONFIG': 'pkg-config --static',
    'PKG_CONFIG_PATH': STAGING_DIR / '$PREFIX/lib/pkgconfig',
}

LIBFOO_CONF_OPTS = [
    # static only
    '--disable-shared',
    # features
    '--without-feature-a',
    '--without-feature-c',
    # disable extras and miscellaneous
    '--disable-docs',
]
```

5.2 Cargo package examples

An example Cargo package definition:

package/libfoo/libfoo.rt

```
LIBFOO_LICENSE = ['BSD-2-Clause']
LIBFOO_LICENSE_FILES = ['LICENSE']
LIBFOO_SITE = 'git+git@example.com:base/libfoo.git'
LIBFOO_TYPE = 'cargo'

LIBFOO__CUSTOM_FEATURES = [
    # tailor specific features
    '--no-default-features',
    '--features', 'feature-a,feature-b',
]

LIBFOO_BUILD_OPTS = [
    *LIBFOO__CUSTOM_FEATURES,
]

LIBFOO_INSTALL_OPTS = [
    *LIBFOO__CUSTOM_FEATURES,
]
```

5.3 CMake package examples

An example CMake package definition:

package/libfoo/libfoo.rt

```
LIBFOO_NEEDS = [
    'libbar',
]

LIBFOO_LICENSE = ['Apache-2.0']
LIBFOO_LICENSE_FILES = ['LICENSE.txt']
LIBFOO_REVISION = 'sdk-1.2.170.0'
LIBFOO_SITE = 'https://git.example.com/example/example.git'
LIBFOO_TYPE = 'cmake'
LIBFOO_VERSION = '1.2.170'

LIBFOO_CONF_DEFS = {
    'BUILD_FEATURE_A': 'ON',
    'BUILD_SAMPLES': 'OFF',
    'LIBBAR_INSTALL_DIR': STAGING_DIR,
}
```

5.4 Make package examples

An example Make package definition:

package/libfoo/libfoo.rt

```
LIBFOO_LICENSE = 'GPL-3.0-or-later'
LIBFOO_LICENSE_FILES = 'README'
LIBFOO_SITE = 'https://git.example.com/eng/support/libfoo.git'
LIBFOO_TYPE = 'make'
LIBFOO_VERSION = '0.23'

LIBFOO_INSTALL_OPTS = [
    'install-minimal',
]
```

5.5 Meson package examples

An example Meson package definition:

package/scantool/scantool.rt

```
SCANTOOL_LICENSE = 'OSL-2.1'
SCANTOOL_LICENSE_FILES = 'COPYING'
SCANTOOL_MESON_BUILD_TYPE = 'release'
SCANTOOL_REVISION = 'v3.1'
SCANTOOL_SITE = 'hg+https://example.com/scantool'
SCANTOOL_TYPE = 'meson'

SCANTOOL_ENV = {
    'SCANTOOL_OPT_MODE': 'final',
}
```

5.6 Python package examples

An example Python package definition:

package/myhosttool/myhosttool.rt

```
MYHOSTTOOL_INSTALL_TYPE = 'host'
MYHOSTTOOL_PYTHON_SETUP_TYPE = 'setuptools'
MYHOSTTOOL_REVISION = 'v${MYHOSTTOOL_VERSION}'
MYHOSTTOOL_SITE = 'https://git.example.org/utils/myhosttool.git'
MYHOSTTOOL_TYPE = 'python'
MYHOSTTOOL_VERSION = '5.3.0'
```

5.7 SCons package examples

An example SCons package definition:

package/exampleprj/exampleprj.rt

```
EXAMPLEPRJ_INTERNAL = True
EXAMPLEPRJ_SCONS_NOINSTALL = True
EXAMPLEPRJ_SITE = 'svn+https://svn.example.com/repos/exampleprj/c/branches/prj-3.4.5'
EXAMPLEPRJ_TYPE = 'scons'
```

5.8 Waf package examples

An example Waf package definition:

package/myapp/myapp.rt

```
MYAPP_LICENSE = 'Buddy'
MYAPP_LICENSE_FILES = 'COPYING'
MYAPP_REVISION = 'myapp-8.3'
MYAPP_SITE = 'https://git.example.org/mygroup/myapp.git'
MYAPP_TYPE = 'waf'
```

CHAPTER

SIX

REQUESTING HELP

If experience issues with using releng-tool, developing extensions, etc.; do not hesitate to create an issue in this project's GitHub page:

> releng-tool — Issues
> https://github.com/releng-tool/releng-tool/issues

CHAPTER

SEVEN

CONTRIBUTOR GUIDE

The following outlines common directory locations:

- `Documentation` - Project documentation
- `releng_tool/api/` - API for supporting releng-tool extensions
- `releng_tool/engine/` - Core implementation
- `releng_tool/ext/` - Extensions that are maintained in the official tree
- `releng_tool/extract/` - Translate fetched content to a build's working area
- `releng_tool/fetch/` - Support for fetching content from package sites
- `releng_tool/tool/` - Definitions for host tools used by tool features
- `test/` - Testing-related content for this project's implementation

releng-tool is built on the Python language and aims to be the minimum dependency for users of the tool. Specific features enabled by a developer's project may require additional tools (e.g. using Git to fetch sources requires `git` to be installed); however, a user should not be required to install tools for features that are not being used.

7.1 Contributing

Developers are free to submit contributions for this project. Developers wishing to contribute should read this project's CONTRIBUTING document. A reminder that any contributions must be signed off with the Developer Certificate of Origin.

Implementation (source, comments, commits, etc.) submitted to this project should be provided in English.

7.2 Root directory

A user invoking releng-tool will attempt to operate in a project root directory. Any content managed by this tool (e.g. creating directories, downloading sources, etc.) should all be performed inside the root directory. Some exceptions exist where a user requests to adjust the download directory (e.g. providing the `--dl-dir` argument).

7.3 Fetching design

Packages can describe where external content should be fetched from. The most common fetching method is a simple URI-style fetch such as downloading an archive from an HTTP/FTP location. Assets acquired in this manner are downloaded into the root directory's download folder (e.g. `<ROOT>/dl`). The extraction phase will later use this folder to find package content to prepare against.

releng-tool also supports the fetching of content from version control systems. Sources can either be fetched and placed into an archive, in a similar fashion as fetching an archive from HTTP/FTP locations, or sources can be fetched into a "cache directory" if supported (typically distributed version controlled sources). For example, Git repositories (see also Git's `--git-dir`) will be stored in the root directory's cache folder (e.g. `<ROOT>/cache`). During the extraction stage, target revisions will be pulled from the cache location using the `git` client.

Not all packages will fetch content (e.g. placeholder packages).

7.4 Extraction design

In most cases, the extraction phase will process archives (e.g. `.tar.gz`, `.zip`, etc.) and place their contents into a package's build working directory. Implementation will vary for fetching implementation which stores content into a cache directory. For example, Git and Mercurial sources have their own extraction implementations to pull content from their respective distributed file systems into a package's build working directory.

7.5 Host and Build environment

releng-tool attempts to minimize the impact of a host system's environment on a project's build. For example, the build phase of a package should not be pulling compiler flags provided from the host system's environment. These flags should be provided from the package definition. Tools invoked by releng-tool will attempt to be invoked to ignore these external environment variables. Some exceptions apply such as environment variables dealing with authorization tokens.

7.6 Documentation

Improvements to this project's documentation are always welcome – not only for adding/updating documentation for releng-tool features but also translations.

For users interested in documentation for this project, please see the following repository:

> releng-tool – Documentation
> https://github.com/releng-tool/releng-tool-docs

CHAPTER

EIGHT

RELEASE NOTES

The following provides the notable features, bug fixes and more for each release of releng-tool. For a complete list of detailed changes to releng-tool, please see the project's repository commits.

8.1 Development

- **(note)** Last version supporting Bazaar sites
- **(note)** Last version supporting Python 3.9
- **(note)** Last version supporting `override_revisions`
- **(note)** Last version supporting `override_sites`
- **(note)** Last version supporting `LIBFOO_SKIP_REMOTE_SCRIPTS`
- **(note)** Last version supporting `LIBFOO_SKIP_REMOTE_CONFIG`
- **(note)** Last version supporting an implicit `LIBFOO_PYTHON_SETUP_TYPE`
- Added a series of package configuration lint checks (RT100-RT115)
- Fix undesired warnings when using `revisions` in development mode
- Fix where `NJOBSCONF` was not properly set when using `RELENG_PARALLEL_LEVEL`
- Improved support for setting local-sources POSIX paths on Windows platforms
- Introduce `LIBFOO_DEVMODE_PATCHES` to support development mode patching
- Introduce `LIBFOO_IGNORE_PATCHES` to support ignoring package patches
- Introduce `LIBFOO_ONLY_DEVMODE` to support development-only packages
- Move package SPDX license check warnings into the lint action
- Printed local-sources paths are now printed in POSIX format
- Support for negative jobs value to reduce detected job usage
- Support not overwriting environment variables when using `releng_env`
- Use of local-sources mode with external packages now generate a warning

8.2 2.8.0 (2026-02-22)

- Allow `LIBFOO_EXTENSION` to support empty extensions
- Introduce `LIBFOO_DEVMODE_SKIP_INTEGRITY_CHECK` for development scenarios
- Introduce `LIBFOO_MAX_JOBS` to help cap/limit package jobs
- Introduce `revisions` project configuration
- Introduce support for Waf-based packages
- Support exit code overrides on a successful run
- Update SPDX license database to v3.28
- Update `sysroot_prefix` to also accept a path-like value

8.3 2.7.0 (2026-02-08)

- Allow project configurations to define a `releng_setup` registry hook
- Failures in loading project extensions will now stop releng-tool
- Fixed some scenarios where using `--debug-extended` may crash releng-tool
- Generate a "step over" message for already processed packages on rebuilds
- Handle trailing path-slash in a path-completed action request
- Improved error handling for incorrect extension handle signatures
- Improved processing of command outputs
- Introduce `LIBFOO_MESON_BUILD_TYPE` to override Meson build types
- Introduce `LIBFOO_PREEXTRACT` to support forced pre-configuration extraction
- Introduce `default_cmake_build_type` project configuration
- Introduce `default_meson_build_type` project configuration
- Introduce `releng_define` helper script function
- Introduce `releng_register_path` helper script function
- Introduce multiple package event types extension can hook into
- Introduce the `lint` action to support quality checks on a project/package
- Introduce the `printvars` action to support dumping package variable names
- Only show SSH error logs for remote Git actions
- Prevent default CMake define conflicts when overrides set in `<PKG>_CONF_DEFS`
- Support `PKG_DEFDIR` in early package configuration variable expansions
- Support `releng_include` sourcing variables into caller script
- Support the existence of a `FORCE_COLOR` environment variable
- Support variable expansion on various logging calls
- Support variable expansion on various path-like utility calls

8.4 2.6.0 (2025-08-03)

- Always output configured local sources paths
- Avoid configuring `CMAKE_PREFIX_PATH` and solely rely on find-related defines
- Detected tool version information is printed in debug mode
- Ensure `CMAKE_MODULE_PATH` paths are pre-populated to avoid directory building
- Handle trailing path-slash in a local sources package reference
- Support a pre-defined `CMAKE_FIND_ROOT_PATH` for staging/target/host areas
- Update SPDX license database to v3.27

8.5 2.5.0 (2025-06-22)

- Avoid forwarding arguments to project when using `<pkg>-exec`
- Drop warnings when using local-site packages
- Introduce a profile argument for a project's configuration discretion
- Support checking multiple Visual Studio installs for `VsDevCmd.bat`

8.6 2.4.0 (2025-05-31)

- Include VCS revisions in generated SBOM documents
- Introduce a `--debug-extended` argument
- Introduce quirk to help disable package-specific ignore-cache flags
- Renamed SBOM format `rdp-spdx` to `rdf-spdx`
- Support Visual Studio Build Tools when using injected Visual Studio support

8.7 2.3.0 (2025-05-04)

- Installed Python packages now use releng-tool interpreter values for launchers
- Introduce `LIBFOO_PYTHON_INSTALLER_INTERPRETER` for interpreter tailoring
- Introduce `RELENG_PARALLEL_LEVEL` for environment-managed job management
- Introduce `releng_path` helper script function
- Ensure Make configuration stage runs if any configuration setting is set
- Ensure SCons configuration stage runs if any configuration setting is set

8.8 2.2.0 (2025-03-29)

- Cleanup unexpected prints in `releng_require_version`
- Extension priority changed: (1) `.rt`, (2) `.py`, (3) *(none)*, (4) `.releng`
- Fixed `releng_copy` not replicating symlinks in base directory
- Improve accepting of path-like arguments into multiple `releng_*` calls
- Improve accepting of path-like arguments into multiple package options
- Patches are applied with the `--verbose` argument
- Support for extensionless configuration/scripts is deprecated
- Support path-like types for multiple path-like script variables
- Support working-directory changing with `releng_tmpdir`

8.9 2.1.1 (2025-02-17)

- Fixed extraction warnings for non-empty folders due to improper fetch flags

8.10 2.1.0 (2025-02-17)

- Avoid multi-fetching packages with ignore-cache in development mode
- Improve ease of unconfiguring local-sources mode with single `unset` call
- Introduce `*_SHARE_DIR` environment/script variables
- Introduce `default_devmode_ignore_cache` project configuration
- Local-sources configurations can now accept `package/`-prefixed entries
- Prevent unused CLI warnings with CMake for releng-tool-managed options
- Support a pre-defined `CMAKE_MODULE_PATH` for CMake staging/target/host areas

8.11 2.0.1 (2025-02-09)

- Including missing completion scripts and man page in source package

8.12 2.0 (2025-02-09)

- **(note)** Support for non-LTS version of Python have been dropped
- Fixed handling of Git submodules using incorrect revisions
- Fixed issue where configured prefixes could be ignored in Python packages
- Fixed issue where file URIs sites may prevent other URL sites from fetching
- Fixed issue where triggering a re-install on select Python packages would fail
- Improved support for host tool integration with Python packages
- Introduce `--only-mirror` argument to force external package fetch with mirror
- Introduce alternative hash-files for package development revisions
- Overhaul of Python package processing with install scheme configuration via `LIBFOO_PYTHON_INSTALLER_SCHEME`, launcher configuration via `LIBFOO_PYTHON_INSTALLER_LAUNCHER_KIND` and dist overrides via `LIBFOO_PYTHON_DIST_PATH`
- Script function `releng_ls` now accepts a `recursive` argument
- Support URL fetch retries on transient errors
- Support for GNU Bazaar sites is deprecated
- Support for Python distutils packages is deprecated
- Support for `override_revisions` is deprecated
- Support for `override_sites` is deprecated
- Support format hints in `url_mirror`
- Support ignoring `stderr` output in execute calls
- Support maximum checks when using `releng_require_version`
- Use of Python's `installer` required for all Python packages

8.13 1.4 (2025-01-19)

- Allow adding a package without a definition that defines at least one script
- Allow users to suppress local-site package warnings
- Correct `hint` missing from script environments
- Disable garbage collection and maintenance tasks for Git caches
- Disable update checks for PDM when processing PDM packages
- Ensure the `punch` action triggers the post-build stage
- Fixed configuration failure when using older Meson (pre-v1.1.1)
- Fixed incorrect JSON/SPDX SBOM documents for projects with empty/local sites
- Fixed issue where `releng_copy` could not copy a broken symbolic link
- Fixed issue where `releng_remove` could not remove a broken symbolic link
- Fixed patch overrides not supporting alternative file extensions
- Flag `RELENG_FORCE` when using the `punch` action
- Introduce `LIBFOO_CARGO_NOINSTALL` to support Cargo libraries
- Introduce `RELENG_EXEC` environment/script variable
- Introduce `libfoo-fresh` action
- Introduce `releng_symlink` helper script function
- Introduce a `nested` option for I/O copy/move utility calls
- Introduce a shared build target for Cargo packages
- Perform automatic Cargo patching for project-managed dependencies
- Post-fetching Cargo dependencies now occurs after a package's patch stage
- Promote use of `.rt` extensions for definitions/scripts
- Promote use of `releng-tool.rt` for project configuration
- Support Breezy VCS-type
- Support injecting Visual Studio development environment variables
- Support newer GitLab CI flag for automatic debugging mode
- Support preallocated list/dictionary package configurations
- Update SPDX license database to v3.26
- Utilize forwarded arguments as fallback for `libfoo-exec` action

8.14 1.3 (2024-08-19)

- Automatic debugging mode when detecting CI debugging runs
- Correct unexpected dot in prefix path variables for empty prefixed builds
- Fixed incorrect specification version tag in RDF/SPDX SBOM documents
- Fixed issue where an aborted Mercurial fetch could require manual cleanup
- Include license list version in SPDX SBOM documents
- Introduce `LIBFOO_NEEDS` to replace `LIBFOO_DEPENDENCIES`
- Introduce `RELENG_GENERATED_LICENSES` script variable
- Introduce `RELENG_GENERATED_SBOMS` script variable
- Introduce `environment` project configuration
- Introduce support for Cargo-based packages
- Remote package configuration/scripting is now opt-in
- Script helper `releng_mkdir` will now return the path
- Support multiple path components in `releng_mkdir`
- Support variable expansion for `releng_execute` arguments
- Unknown arguments will now generate an error by default
- Update SPDX license database to v3.25

8.15 1.2 (2024-07-01)

- Introduce the `punch` action to support forced rebuild of packages
- Support automatic package preparation for compatible local-sourced packages
- Update SPDX license database to v3.24

8.16 1.1 (2024-03-29)

- Prevent SSH authentication prompts that may occur when using Git
- Support SPDX license identifier field for custom licenses
- Support environment output directory override (`RELENG_OUTPUT_DIR`)
- Support global output containers (`RELENG_GLOBAL_OUTPUT_CONTAINER_DIR`)
- Update SPDX license database to v3.23

8.17 1.0 (2023-12-22)

- Introduce `RELENG_SCRIPT` and `RELENG_SCRIPT_DIR` variables
- Update SPDX license database to v3.22

8.18 0.17 (2023-08-06)

- Fixed issue with CMake-generated export targets missing prefix overrides
- Fixed issue with local-source configurations when provided relative paths
- Introduce `LIBFOO_CMAKE_BUILD_TYPE` to override CMake build types
- Introduce `LIBFOO_ENV` to apply environment variables on multiple stages
- Introduce `state` action for dumping configured releng-tool state
- Introduce support for Perforce sites
- Support Git repository interaction in output directories for Git-based sources
- Support ability to unconfigure development/local-sources mode
- Support the existence of a `NO_COLOR` environment variable
- Update SPDX license database to v3.21

8.19 0.16 (2023-05-07)

- Enforce strict hash checking in development mode for external packages which define a development revision
- Fixed issue where `releng_copy` may fail when provided a single part relative destination
- Fixed issue where HTML-based software build of materials would be empty
- Introduce support for Meson-based packages
- Prevent processing packages when SBOM generation is explicitly requested
- Support SPDX-tailored software build of materials
- Support module-specific local-sources to accept `:` instead of `@`, allowing certain shells to take advantage of path auto-completion

8.20 0.15 (2023-02-12)

- CMake install events will now always skip dependency checks
- Fixed issue where extension loading may cause issues in Python 2.7
- Fixed issue where reconfiguration may not flag rebuild flags (and related)
- Fixed issue where statistics (PDF) may fail on legacy matplotlib environments
- Improve support for patching a root build directory and sub-directories
- Introduce extension support for event listeners
- Make projects will now be provided a `PREFIX` override
- Source distribution now includes completion scripts and tests
- Support setting software build of materials format in project configuration

8.21 0.14 (2023-02-05)

- **(note)** The deprecated `releng` namespace has been removed
- CMake install events will now always force installs by default
- Fixed issue where CMake projects with implicit target area installs have issues finding includes/libraries with `find_<x>` calls
- Fixed issue where `libfoo-exec` action with an = character would crash
- Introduce `*_BIN_DIR` environment/script variables
- Introduce `releng_move_into` helper script function
- Local VCS-type packages should now place sources inside a `local` folder
- Promote the use of SPDX license identifiers in package license options
- Support `.releng` extensions for scripts
- Support automatic include injection for CMake staging/target/host areas
- Support for Poetry Python setup type
- Support generating a software build of materials
- Support treating releng-tool warnings as errors with `--werror` argument
- Support user paths in package-specific local-sources overrides

8.22 0.13 (2022-08-10)

- Avoid interaction with target area when using CMake projects that only uses the staging area
- Downloaded files will now be stored in sub-directories under `dl/`
- Ensure clean-related environment/script variables are set for package-specific clean requests
- Fixed a rare chance that an explicit package run provided via command line may be ignored
- Fixed issue in older Python interpreters where the executed package order may not be consistent
- Fixed issue where select package-specific environment variables may leak into other packages
- Improve handling of `file://` sites in Windows
- Improve support for host-built Python packages
- Introduce `LIBFOO_HOST_PROVIDES` to help skip prerequisite checks
- Introduce `PKG_DEVMODE` environment/script variable
- Introduce `RELENG_TARGET_PKG` environment/script variable
- Introduce `releng_copy_into` helper script function
- Introduce support for Python setup types
- Introduce support for SCons-based packages
- Introduce support for development mode configurations, allowing users to target specific revisions or sites for packages supporting alternative source revisions
- Introduce support for global and package-specific path overrides when operating in local-sources mode
- Introduce support for make-based packages
- Support `PKG_DEFDIR` usage inside a package's definition
- Support Bazaar quirk to utilize `certifi` certificates
- Support users overriding a project's configuration path from command line

8.23 0.12 (2022-05-02)

- Adding `dst_dir` to `releng_copy` for explicit copies to directories
- Adjust automatic job detection to use physical cores instead of logical cores
- Fixed an issue where forced Git-fetches with branch revisions may have stale content on first extract
- Fixed where package-specific prefixes/njobs would leak to other projects
- Introduce `*_[INCLUDE,LIB]_DIR` environment/script variables
- Introduce `PKG_BUILD_BASE_DIR` environment/script variable
- Introduce `PREFIXED_*_DIR` environment/script variables
- Introduce `libfoo-exec` action
- Introduce `releng_include` helper script function
- Support Make-styled environment injections via command line
- Support package variable overrides via command line

8.24 0.11 (2022-02-26)

- Always pre-create install directory before package install scripts are invoked
- Fixed an issue where nested zip files could not extract
- Introduce `releng_cat` helper script function
- Introduce `releng_ls` helper script function
- Introduce `releng_require_version` helper script function
- No longer extract with non-local-supported tar command if host format detected
- No longer warn if hash file is empty for extracted contents check
- Support removing cached assets through a forced fetch argument
- Support triggering a reconfiguration of all packages through a force argument

8.25 0.10 (2021-12-31)

- Fixed an issue where a configured `sysroot_prefix` bin path would not be registered in the script environment's path
- Fixed an issue where `releng_mkdir` reports success if the target path is a file that already exists
- Fixed an issue where extensions may not load on Python 2.7
- Fixed an issue where post-processing may be invoked even if a package's stage would fail
- Introduce `<PKG_NAME>_DEFDIR` environment/script variable
- Introduce `LIBFOO_CMAKE_NOINSTALL` for CMake packages with no install rule
- Introduce support for rsync sites
- Provide an option to suppress root warning (for zero-UID containers)
- Remove the requirement to have a package version entry
- Support configuring cache/download directories using environment variables
- Support custom SSL context overrides via `urlopen_context`
- Support providing an assets container directory (for cache/download folders)

8.26 0.9 (2021-10-02)

- Fixed an import issue when running with Python 3.10
- Fixed an issue where a cyclic package check provided a bad message
- Fixed an issue where a Git submodule with a target branch may fail to extract
- Post-processing script renamed to `releng-post-build`
- Support development mode relaxed branch fetching for Git sites
- Support requiring a Git source's revision to be GnuPG-signed (GPG)
- Support using ASCII-armor (asc) files to package integrity checks

8.27 0.8 (2021-08-28)

- Allow DVCS packages to share caches (to minimize space/time fetching)
- Fixed an issue where tools/`releng_execute` requests would fail on Python 2.7 with Unicode-defined environment variables
- Fixed an issue where a diverged revision in Git would incorrectly populate a package's build directory with the cached revision instead of the remote revision
- Introduce `LIBFOO_GIT_SUBMODULES` for package Git-specific configurations
- Introduce `releng_execute_rv` helper script function
- Introduce statistic tracking (stage durations) which generate to into the output folder after execution
- Introduce support for package-specific distclean
- Introduce support for package-specific license processing
- Package-specific extraction/patching no longer requires dependency processing
- Rework `LIBTOOL_GIT_REFSPECS` to provide more control over custom revisions that can be fixed (i.e. no longer fixed on `<target>/*/head`; instead, a configured value-wildcard string should be used)
- Support auto-detecting Python interpreter path overrides in windows
- Support faster Git fetching
- Support pruning any remote-tracked references in a Git-cached project when a forced fetch request is made

8.28 0.7 (2021-08-08)

- Fetch from an already cached package's site if the fetch is explicitly requested
- Fixed an issue with registry failing to import on Python 2.7
- Fixed issue where build/install definitions where not used in in their respective stages
- Fixed issue where mercurial packages fetched using the version option instead of the revision option
- Fixed issue where the host directory was not registered in a stage's path
- Introduce clean, logging flags and releng-version into the script environments
- Only fetch a single package if only said package is requested to be fetched
- Package without a site will throw an error when VCS-type is set
- Reconfigure/rebuild requests will now perform all trailing stages for the package(s) being redone; rebuild/reconfigure-only actions have been introduced to force re-invoking a specific stage
- Support loading remote package configuration
- Support loading remote package scripts
- releng-tool will now full stop if external package definition fails to load

8.29 0.6 (2020-10-10)

- Always register optional flags inside scripts (allowing developers to use flags like `RELENG_RECONFIGURE` without needing to check environment variables)
- Fixed issued when capturing with `releng_execute` which did not suppress output by default
- Introduce `LIBTOOL_GIT_CONFIG` for package git-specific configurations
- Introduce a `releng-tool init` action for a quick-sample project
- Introduce support for distclean
- Introduce support for prerequisites
- Namespace moved from `releng` to `releng_tool` (`releng` deprecated for an interim)

8.30 0.5 (2020-09-07)

- Fixed false error when verifying cached Git reference

8.31 0.4 (2020-09-07)

- Allow developers to fetch from addition Git refspecs (e.g. pull requests)
- Allow setting quirks in command line
- Fixed a scenario where a Git extraction stage could fetch sources
- Fixed Git fetch/extraction if package is cached and site has changed
- Improved handling of output files which may set the read-only attribute
- Introduce support for local interim-development package content
- Introduce support for shallow Git fetching

8.32 0.3 (2019-10-19)

- Allow packages to configure to ignore cache while in development mode
- Allow packages to configure for no-extraction for sources
- Fixed default interpreter detection for Python packages
- Fixed fetching from Mercurial sources
- Fixed fetching from newer Git hashes if repository was already cached
- Introduce `releng_env` and `releng_mkdir` helper script functions
- Introduce support for package-specific bootstrapping stage

8.33 0.2 (2019-03-15)

- A project's host directory will now be registered in the system's path during execution
- Allow tracking project's license files when found in multiple directories
- Fixed loading configuration overrides script if one actually exists
- Re-work various script names (e.g. `releng.py` -> `releng`)

8.34 0.1 (2019-02-24)

- Hello world

CHAPTER

NINE

ANNEX A — QUICK REFERENCE

A quick reference document listing available options to developers building a releng-tool project.

9.1 Arguments

Arguments which are accepted by releng-tool from the command line:

```
clean
distclean
extract
fetch
fetch-full
init
licenses
lint
mrproper
patch
printvars
punch
sbom
state
<pkg>-build
<pkg>-clean
<pkg>-configure
<pkg>-distclean
<pkg>-exec "<cmd>"
<pkg>-extract
<pkg>-fetch
<pkg>-fetch-full
<pkg>-fresh
<pkg>-install
<pkg>-license
<pkg>-lint
<pkg>-patch
<pkg>-printvars
<pkg>-rebuild
<pkg>-rebuild-only
<pkg>-reconfigure
<pkg>-reconfigure-only
<pkg>-reinstall
--assets-dir <dir>
--cache-dir <dir>
--config <file>
--debug
--debug-extended
--development [<mode>], -D [<mode>]
--dl-dir <dir>
--force, -F
--help, -h
--images-dir <dir>
--jobs <jobs>, -j <jobs>
--local-sources [[<pkg>:]<dir>], -L [[<pkg>:]<dir>]
--nocolorout
--only-mirror
--out-dir <dir>
--profile [<profile>], -P [<profile>]
--relaxed-args
```

```
--root-dir <dir>, -R <dir>
--sbom-format <fmt>
--success-exit-code <code>
--quirk <quirk-id>
--verbose, -V
--version
--werror, -Werror
```

9.2 Configuration options

Options which are read by releng-tool from a project's configuration script (`releng-tool.rt`):

```
cache_ext = <callable>
default_devmode_ignore_cache = bool
default_cmake_build_type = str
default_meson_build_type = str
default_internal = bool
environment = {'<key>': '<val>'}
extensions = ['<extension>', '<extension>']
external_packages = ['<path>', '<path>']
extra_license_exceptions = {'<short-exception-id>': '<exception-name>'}
extra_licenses = {'<short-license-id>': '<license-name>'}
license_header = '<data>'
override_extract_tools = {'<tool>': '<tool-path>'}
override_revisions = {'<pkg>': '<revision>'}   (deprecated)
override_sites = {'<pkg>': '<site>'}   (deprecated)
packages = ['<pkg>', '<pkg>', '<pkg>']
prerequisites = ['<tool>', '<tool>', '<tool>']
quirks = ['<quirk-id>']
revisions = {'<pkg>': '<revision>'}
sbom_format = '<format>'
  └── csv, html, json, json-spdx, rdf-spdx, text, xml
sysroot_prefix = '<path>' # '/usr'
url_mirror = '<mirror-url>'
urlopen_context = <ssl.SSLContext>
vsdevcmd = bool or str
vsdevcmd_products = str
```

9.3 Environment variables

Environment (and script) variables available to context's invoked by releng-tool (may vary per context):

BUILD_DIR
CACHE_DIR
DL_DIR
HOST_BIN_DIR
HOST_DIR
HOST_INCLUDE_DIR
HOST_LIB_DIR
HOST_SHARE_DIR
IMAGES_DIR
LICENSE_DIR
NJOBS
NJOBSCONF
OUTPUT_DIR
PKG_BUILD_BASE_DIR
PKG_BUILD_DIR
PKG_BUILD_OUTPUT_DIR
PKG_CACHE_DIR
PKG_CACHE_FILE
PKG_DEFDIR
PKG_DEVMODE
PKG_INTERNAL
PKG_LOCALSRCS
PKG_NAME
PKG_REVISION
PKG_SITE
PKG_VERSION
PREFIX
PREFIXED_HOST_DIR
PREFIXED_STAGING_DIR
PREFIXED_TARGET_DIR
RELENG_CLEAN
RELENG_DEBUG
RELENG_DEVMODE
RELENG_DISTCLEAN
RELENG_EXEC
RELENG_FORCE
RELENG_GENERATED_LICENSES
RELENG_GENERATED_SBOMS
RELENG_LOCALSRCS
RELENG_MRPROPER
RELENG_PROFILES
RELENG_REBUILD
RELENG_RECONFIGURE
RELENG_REINSTALL
RELENG_SCRIPT
RELENG_SCRIPT_DIR
RELENG_TARGET_PKG
RELENG_VERBOSE
RELENG_VERSION
ROOT_DIR

```
STAGING_BIN_DIR
STAGING_DIR
STAGING_INCLUDE_DIR
STAGING_LIB_DIR
STAGING_SHARE_DIR
SYMBOLS_DIR
TARGET_BIN_DIR
TARGET_DIR
TARGET_INCLUDE_DIR
TARGET_LIB_DIR
TARGET_SHARE_DIR
<PKG_NAME>_BUILD_DIR
<PKG_NAME>_BUILD_OUTPUT_DIR
<PKG_NAME>_DEFDIR
<PKG_NAME>_NAME
<PKG_NAME>_REVISION
<PKG_NAME>_VERSION
```

Other environment variables accepted by releng-tool:

```
FORCE_COLOR
NO_COLOR
RELENG_ASSETS_DIR
RELENG_CACHE_DIR
RELENG_DL_DIR
RELENG_GLOBAL_OUTPUT_CONTAINER_DIR
RELENG_IGNORE_RUNNING_AS_ROOT
RELENG_IGNORE_UNKNOWN_ARGS
RELENG_IMAGES_DIR
RELENG_OUTPUT_DIR
RELENG_PARALLEL_LEVEL
```

9.4 Package types

Package types supported by releng-tool:

```
Autotools
CMake
Cargo
Make
Meson
Python
SCons
Script (default)
Waf
```

9.5 Package options

Configuration options parsed by releng-tool for a package definition:

```
LIBFOO_AUTOTOOLS_AUTORECONF = bool
LIBFOO_BUILD_DEFS = {'FOO': 'BAR'}
  └── (Autotools, Cargo, CMake, Make, Meson, Python, SCons, Waf)
LIBFOO_BUILD_ENV = {'FOO': 'BAR'}
  └── (Autotools, Cargo, CMake, Make, Meson, Python, SCons, Waf)
LIBFOO_BUILD_OPTS = {'--option': 'value'} or ['--option', 'value']
  └── (Autotools, Cargo, CMake, Make, Meson, Python, SCons, Waf)
LIBFOO_BUILD_SUBDIR = '<subdir>'
LIBFOO_CARGO_NAME = '<name>'
LIBFOO_CARGO_NOINSTALL = bool
LIBFOO_CMAKE_BUILD_TYPE = '<build-type>'
  └── Debug, Release, RelWithDebInfo (default), MinSizeRel
LIBFOO_CMAKE_NOINSTALL = bool
LIBFOO_CONF_DEFS = {'FOO': 'BAR'}
  └── (Autotools, CMake, Make, Meson, SCons, Waf)
LIBFOO_CONF_ENV = {'FOO': 'BAR'}
  └── (Autotools, CMake, Make, Meson, SCons, Waf)
LIBFOO_CONF_OPTS = {'--option': 'value'} or ['--option', 'value']
  └── (Autotools, CMake, Make, Meson, SCons, Waf)
LIBFOO_DEPENDENCIES = ['<pkg>', '<pkg>']   (deprecated)
LIBFOO_DEVMODE_IGNORE_CACHE = bool
LIBFOO_DEVMODE_PATCHES = bool, '<pattern>', ['<pattern>'] or {'<mode>': bool or str}
LIBFOO_DEVMODE_REVISION = '<revision>'
LIBFOO_ENV = {'FOO': 'BAR'}
  └── (Autotools, Cargo, CMake, Make, Meson, Python, SCons, Waf)
LIBFOO_DEVMODE_SKIP_INTEGRITY_CHECK = bool
LIBFOO_EXTENSION = '<extension>'
LIBFOO_EXTERNAL = bool
LIBFOO_EXTOPT = {'FOO': 'BAR'}
LIBFOO_EXTRACT_TYPE = 'ext-<extraction-extension>'
LIBFOO_FETCH_OPTS = {'--option': 'value'} or ['--option', 'value']
LIBFOO_FIXED_JOBS = int # >= 1
LIBFOO_GIT_CONFIG = {'FOO': 'BAR'}
LIBFOO_GIT_DEPTH = int # >= 0
LIBFOO_GIT_REFSPECS = ['<refspec>'] # e.g. pull
LIBFOO_GIT_SUBMODULES = bool
LIBFOO_GIT_VERIFY_REVISION = bool
LIBFOO_HOST_PROVIDES = '<tool>' or ['<tool-a>', '<tool-b>']
LIBFOO_IGNORE_PATCHES = bool, '<pattern>' or ['<pattern>']
LIBFOO_INSTALL_DEFS = {'FOO': 'BAR'}
  └── (Autotools, Cargo, CMake, Make, Meson, SCons, Waf)
LIBFOO_INSTALL_ENV = {'FOO': 'BAR'}
  └── (Autotools, Cargo, CMake, Make, Meson, SCons, Waf)
LIBFOO_INSTALL_OPTS = {'--option': 'value'} or ['--option', 'value']
  └── (Autotools, Cargo, CMake, Make, Meson, SCons, Waf)
LIBFOO_INSTALL_TYPE = '<install-type>'
  └── host, images, staging, staging_and_target, target
LIBFOO_INTERNAL = bool
LIBFOO_MAKE_NOINSTALL = bool
LIBFOO_MAX_JOBS = int
```

```
LIBFOO_MESON_BUILD_TYPE = '<build-type>'
  └── plain, debug, debugoptimized (default), release, minsize
LIBFOO_MESON_NOINSTALL = bool
LIBFOO_NEEDS = ['<pkg>', '<pkg>']
LIBFOO_NO_EXTRACTION = bool
LIBFOO_LICENSE = '<license>' or ['<license>', '<license>']
LIBFOO_LICENSE_FILES = '<file>' or ['<file>', '<file>']
LIBFOO_ONLY_DEVMODE = bool, '<mode>' or ['<mode>']
LIBFOO_PATCH_SUBDIR = '<subdir>'
LIBFOO_PREEXTRACT = bool
LIBFOO_PREFIX = '<path>' # '/usr'
LIBFOO_PYTHON_DIST_PATH = '<path>'  # e.g. 'dist/'
LIBFOO_PYTHON_INSTALLER_INTERPRETER = '<interpreter>'
LIBFOO_PYTHON_INSTALLER_LAUNCHER_KIND = '<kind>'
  └── posix, win-amd64, win-arm64, win-arm, win-ia32
LIBFOO_PYTHON_INSTALLER_SCHEME = dict or str
LIBFOO_PYTHON_INTERPRETER = '<path>'
LIBFOO_PYTHON_SETUP_TYPE = '<setup-type>'
  └── distutils, setuptools, flit, hatch, pdm, pep517, poetry
LIBFOO_REMOTE_CONFIG = bool   (deprecated)
LIBFOO_REMOTE_SCRIPTS = bool   (deprecated)
LIBFOO_REVISION = '<revision>'
LIBFOO_SCONS_NOINSTALL = bool
LIBFOO_SKIP_REMOTE_CONFIG = bool   (deprecated)
LIBFOO_SKIP_REMOTE_SCRIPTS = bool   (deprecated)
LIBFOO_SITE = '<site>'
LIBFOO_STRIP_COUNT = int # >= 0
LIBFOO_TYPE = '<type>'
  └── autotools, cargo, cmake, make, meson, python, scons, script, waf, ext-<extension>
LIBFOO_VCS_TYPE = '<vcs-type>'
  └── brz, bzr, cvs, file, git, hg, local, none, perforce, rsync, scp, svn, url
LIBFOO_VERSION = '<version>'
LIBFOO_VSDEVCMD = bool or str
LIBFOO_VSDEVCMD_PRODUCTS = str
LIBFOO_WAF_NOINSTALL = bool
```

9.6 Script helpers

Functions available to scripts invoked by releng-tool or importable via `from releng_tool import *`:

```
debug(msg, *args)
err(msg, *args)
hint(msg, *args)
log(msg, *args)
note(msg, *args)
releng_cat(file, *args)
releng_copy(src, dst, quiet=False, critical=True, dst_dir=None, nested=False)
releng_copy_into(src, dst, quiet=False, critical=True, nested=False)
releng_define(var, default=None)
releng_env(key, value=None)
releng_execute(args, cwd=None, env=None, env_update=None, quiet=False, critical=True,
               poll=False, capture=None, expand=None, args_native=False)
releng_execute_rv(command, args, cwd=None, env=None, env_update=None, args_native=False)
releng_exists(path, *args)
releng_exit(msg=None, code=None)
releng_expand(obj, kv=None)
releng_include(file_path)
releng_join(path, *args)
releng_ls(dir_, recursive=False)
releng_mkdir(dir_, *args, quiet=False)
releng_move(src, dst, quiet=False, critical=True, dst_dir=None, nested=False)
releng_move_into(src, dst, quiet=False, critical=True, nested=False)
releng_path(*pathsegments)
releng_remove(path, quiet=False)
releng_require_version(minver, maxver=None, quiet=False, critical=True)
releng_symlink(target, link_path, quiet=False, critical=True, lpd=False, relative=True)
releng_tmpdir(dir_=None, *args, wd=False)
releng_touch(file, *args)
releng_wd(dir_)
success(msg, *args)
verbose(msg, *args)
warn(msg, *args)
```

9.7 Quirks

Quirk options used by releng-tool:

```
releng.bzr.certifi
releng.cmake.disable_direct_includes
releng.disable_devmode_ignore_cache
releng.disable_local_site_warn
releng.disable_prerequisites_check
releng.disable_remote_configs
releng.disable_remote_scripts
releng.disable_spdx_check
releng.disable_verbose_patch
releng.git.no_depth
releng.git.no_quick_fetch
releng.git.replicate_cache
releng.ignore_failed_extensions
releng.log.execute_args
releng.log.execute_env
releng.stats.no_pdf
```

INDEX