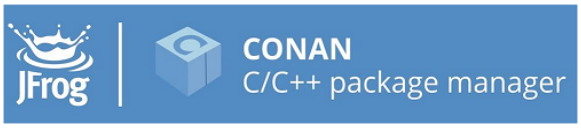


# conan Documentation

***Release 1.9.2***

**conan**

**Jun 04, 2019**

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Conan is a portable package manager, intended for C and C++ developers, but it is able to manage builds from source, dependencies, and precompiled binaries for any language.

For more information, check conan.io.

Contents:

CHAPTER

ONE

# INTRODUCTION

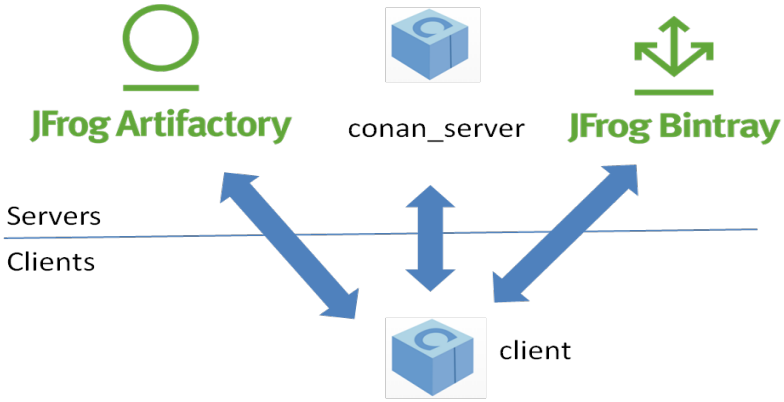
## 1.1 Open Source

Conan is OSS, with an MIT license. Check out the source code and issue tracking (for reporting bugs and for feature requests) at https://github.com/conan-io/conan

## 1.2 Decentralized package manager

Conan is a decentralized package manager with a client-server architecture. This means that clients can fetch packages from, as well as upload packages to, different servers ("remotes"), similar to the "git" push-pull model to/from git remotes.

On a high level, the servers are just package storage. They do not build nor create the packages. The packages are created by the client, and if binaries are built from sources, that compilation is also done by the client application.



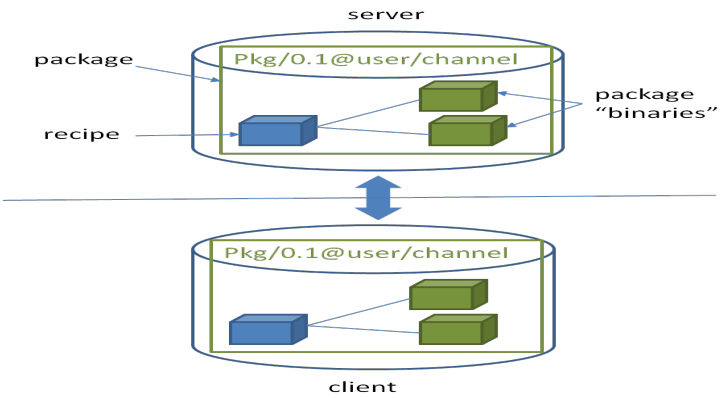

The different applications in the image above are:

- The **Conan client**: this is a console/terminal command line application, containing the heavy logic for package creation and consumption. Conan client has a local cache for package storage, and so it allows you to fully create and test packages offline. You can also **work offline** so long as no new packages are needed from remote servers.
- The **Conan server**: this is a TCP server that can be easily run as your **own server on-premises** to host your private packages. It is also a service application that can be run as a daemon or service, behind a web server (apache, nginx), or easily as stand-alone application. Both the Conan client and the conan_server are OSS, MIT license, so you can use them for free in your company, customize them, or redistribute them without any legal issue.

- **JFrog** Artifactory offers Conan repositories; so it can also be used as an on-premises server. It is a more powerful solution, featuring a WebUI, multiple auth protocols, High Availability, etc. It also has cloud offerings that will allow you to have private packages without having any on-premises infrastructure.
- **JFrog** Bintray provides a public and free hosting service for OSS Conan packages. Users can create their own repositories under their accounts and organizations, and freely upload Conan packages there, without moderation. You should, however, take into account that those packages will be public, and so they must conform to the respective licenses, especially if the packages contain third party code. Just reading or retrieving Conan packages from Bintray, doesn't require an account, an account is only needed to upload packages. Besides that, Bintray provides a central repository called conan-center which is moderated, and packages are reviewed before being accepted to ensure quality.

## 1.3 Binary management

One of the most powerful features of Conan is that it can manage pre-compiled binaries for packages. To define a package, referenced by its name, version, user and channel, a package recipe is needed. Such a package recipe is a conanfile.py python script that defines how the package is built from sources, what the final binary artifacts are, the package dependencies, etc.




When a package recipe is used in the Conan client, and a "binary package" is built from sources, that binary package will be compatible with specific settings, such as the OS it was created for, the compiler and compiler version, or the computer architecture. If the package is built again from the same sources but with different settings, (e.g. for a different architecture), a new, different binary will be generated. By the way, "binary package" is in quotes because, strictly, it is not necessarily a binary. A header-only library, for example, will contain just the headers in the "binary package".

All the binary packages generated from a package recipe are managed and stored coherently. When they are uploaded to a remote, they stay connected. Also, different clients building binaries from the same package recipe (like CI build slaves in different operating systems), will upload their binaries under the same package name to the remotes.

Package consumers (client application users that are installing existing packages to reuse in their projects) will typically retrieve pre-compiled binaries for their systems in case such compatible binaries exist. Otherwise those packages will be built from sources on the client machine to create a binary package matching their settings.

## 1.4 Cross platform, build system agnostic

Conan works and is being actively used on Windows, Linux (Ubuntu, Debian, RedHat, ArchLinux, Raspbian), OSX, FreeBSD, and SunOS, and, as it is portable, it might work in any other platform that can run python. In the documentation, examples for a specific OS might be found, such as `conan install . -s compiler="Visual`

**Studio"**, which will be specific for Windows users. If on a different system, the reader should adapt to their own platform and settings (for example **conan install . -s compiler=gcc**).

Also **Conan works with any build system**. In the documentation, CMake will be widely used, because it is portable and well known. But Conan does not depend on CMake at all; it is not a requirement. **Conan is totally orthogonal to the build system**. There are some utilities that improve the usage of popular build systems such as CMake or Autotools, but they are just helpers. Furthermore, it is not necessary that all the packages are built with the same build system. It is possible to depend on packages created with other build system than the one you are using to build your project.

## 1.5 Stable

From Conan 1.0, there is a commitment to stability, not breaking user space while evolving the tool and the platform. This means:

- Moving forward to following minor versions 1.1, 1.2, ..., 1.X should never break existing recipes, packages or command line flows
- If something is breaking, it will be considered a bug and reverted
- Bug fixes will not be considered breaking, recipes and packages relying on the incorrect behavior of such bug will be considered already broken.
- Only documented features are considered part of the public interface of Conan. Private implementation details, and everything not included in the documentation is subject to change.
- *conanfile.py* recipes should be defined according to the documentation in *conanfile.py*
- Configuration and automatic tools detection, like the detection of the default profile might be subject to change. Users are encouraged to define their configurations in profiles for repeatability. New installations of conan might use different configuration.

The compatibility is always considered forward. New APIs, tools, methods, helpers can be added in following 1.X versions. Recipes and packages created with these features will be backwards incompatible with earlier conan versions.

This means that public repositories, like conan-center assume the use of the latest version of the Conan client, and using an older version may result in failure of packages and recipes created with a newer version of the client.

Additionally, starting in version 1.6, we began the process of deprecating Python2 support. Features already working with python2 will continue to do so, but new ones may require Python3. See the *deprecation notice* for more details

If you have any question regarding Conan updates, stability, or any clarification about this definition of stability, please report in the documentation issue tracker: https://github.com/conan-io/docs.

Got any doubts? Please check out our *FAQ section* or .

CHAPTER

TWO

# INSTALL

Conan can be installed in many Operating Systems. It has been extensively used and tested in Windows, Linux (different distros), OSX, and is also actively used in FreeBSD and Solaris SunOS. There are also several additional operating systems on which it has been reported to work.

There are three ways to install Conan:

1. The preferred and **strongly recommended way to install Conan** is from PyPI, the Python Package Index, using the `pip` command.
2. There are other available installers for different systems, which might come with a bundled python interpreter, so that you don't have to install python first. Note that some of **these installers might have some limitations**, specially those created with pyinstaller (such as Windows exe & Linux deb).
3. Running Conan from sources.

## 2.1 Install with pip (recommended)

To install Conan using `pip`, you need Python 2.7 or 3.X distribution installed on your machine. Modern Python distros come with pip pre-installed. However, if necessary you can install pip by following the instructions in pip docs.

**Warning:** Python 2 will soon be deprecated by the Python maintainers. It is strongly recommended to use Python 3 with Conan, especially if need to manage non-ascii filenames or file contents. Conan still supports Python 2, however some of the dependencies have started to be supported only by Python 3. See *Python 2 Deprecation Notice* for details.

Install Conan:

```
$ pip install conan
```

**Important: Please READ carefully**

- Make sure that your **pip** installation matches your **Python (2.7 or 3.X)** version.
- In **Linux**, you may need **sudo** permissions to install Conan globally.
- We strongly recommend using **virtualenvs** (virtualenvwrapper works great) for everything related to Python.
- In **Windows** and Python 2.7, you may need to use **32bit** python distribution (which is the Windows default), instead of 64 bit.
- In **OSX**, especially the latest versions that may have **System Integrity Protection**, pip may fail. Try using virtualenvs, or install with another user `$ pip install --user conan`.

- If you are using Windows and Python <3.5, you may have issues if Python is installed in a path with spaces, such as "C:/Program Files(x86)/Python". This is a known Python limitation, and is not related to Conan. Try installing Python in a path without spaces, use a virtualenv in another location or upgrade your Python installation.
- Some Linux distros, such as Linux Mint, require a restart (shell restart, or logout/system if not enough) after installation, so Conan is found in the path.
- Windows, Python 3 installation can fail installing the `wrapt` dependency because of a bug in **pip**. Information about this issue and workarounds is available here: https://github.com/GrahamDumpleton/wrapt/issues/112.
- Conan works with Python 2.7, but not all features are available when not using Python 3.x starting with version 1.6

## 2.2 Install from brew (OSX)

There is a brew recipe, so in OSX, you can install Conan as follows:

```
$ brew update
$ brew install conan
```

## 2.3 Install from AUR (Arch Linux)

The easiest way to install Conan on Arch Linux is by using one of the Arch User Repository (AUR) helpers, e.g., **yay**, **aurman**, or **pakku**. For example, the following command installs Conan using `yay`:

```
$ yay -S conan
```

Alternatively, build and install Conan manually using `makepkg` and `pacman` as described in the Arch Wiki. Conan build files can be downloaded from AUR: https://aur.archlinux.org/packages/conan/. Make sure to first install the three Conan dependencies which are also found in AUR:

- python-patch
- python-node-semver
- python-pluginbase

## 2.4 Install the binaries

Go to the conan website and download the installer for your platform!

Execute the installer. You don't need to install python.

## 2.5 Initial configuration

Check if Conan is installed correctly. Run the following command in your console:

```
$ conan
```

The response should be similar to:

```
Consumer commands
  install    Installs the requirements specified in a conanfile (.py or .txt).
  config     Manages configuration. Edits the conan.conf or installs config files.
  get        Gets a file or list a directory of a given reference or package.
  info       Gets information about the dependency graph of a recipe.
  ...
```

## 2.6 Install from source

You can run Conan directly from source code. First, you need to install Python 2.7 or Python 3 and pip.

Clone (or download and unzip) the git repository and install its requirements:

```
$ git clone https://github.com/conan-io/conan.git
$ cd conan
$ pip install -r conans/requirements.txt
```

Create a script to run Conan and add it to your `PATH`.

```
#!/usr/bin/env python

import sys

conan_repo_path = "/home/your_user/conan" # ABSOLUTE PATH TO CONAN REPOSITORY FOLDER

sys.path.append(conan_repo_path)
from conans.client.command import main
main(sys.argv[1:])
```

Test your `conan` script.

```
$ conan
```

You should see the Conan commands help.

## 2.7 Update

If installed via `pip`, Conan can be easily updated:

```
$ pip install conan --upgrade  # Might need sudo or --user
```

If installed via the installers (*.exe*, *.deb*), download the new installer and execute it.

The default *<userhome>/.conan/settings.yml* file, containing the definition of compiler versions, etc., will be upgraded if Conan does not detect local changes, otherwise it will create a *settings.yml.new* with the new settings. If you want to regenerate the settings, you can remove the *settings.yml* file manually and it will be created with the new information the first time it is required.

The upgrade shouldn't affect the installed packages or cache information. If the cache becomes inconsistent somehow, you may want to remove its content by deleting it (*<userhome>/.conan*).

## 2.8 Python 2 Deprecation Notice

All features of Conan until version 1.6 are fully supported in both Python 2 and Python 3. However, new features in upcoming Conan releases that are only available in Python 3 or more easily available in Python 3 will be implemented and tested only in Python 3, and versions of Conan using Python 2 will not have access to that feature. This will be clearly described in code and documentation.

If and when Conan 2.x is released (Not expected in 2018) the level of compatibility with Python 2 may be reduced further.

We encourage you to upgrade to Python 3 as soon as possible. However, if this is impossible for you or your team, we would like to know it. Please give feedback in the Conan issue tracker or write us to info@conan.io.

CHAPTER

THREE

# GETTING STARTED

Let's get started with an example: We are going to create a an MD5 encrypter app that uses one of the most popular C++ libraries: Poco.

We'll use CMake as build system in this case but keep in mind that Conan **works with any build system** and is not limited to using CMake.

## 3.1 An MD5 Encrypter using the Poco Libraries

**Note:** The source files to recreate this project are available in the following GitHub repository. You can skip the manual creation of folder an sources with this command:

```
$ git clone https://github.com/conan-community/poco-md5-example.git
```

1. Let's create a folder for our project:

```
$ mkdir poco-md5-example
$ cd poco-md5-example
```

2. Create the following source file inside this folder. This will be the source file of our application:

Listing 1: **md5.cpp**

```
#include "Poco/MD5Engine.h"
#include "Poco/DigestStream.h"

#include <iostream>


int main(int argc, char** argv)
{
    Poco::MD5Engine md5;
    Poco::DigestOutputStream ds(md5);
    ds << "abcdefghijklmnopqrstuvwxyz";
    ds.close();
    std::cout << Poco::DigestEngine::digestToHex(md5.digest()) <<␣
↪std::endl;
    return 0;
}
```

3. We know that our application relies on the Poco libraries. Let's look for it in the Conan Center remote:

```
$ conan search Poco* --remote=conan-center
Existing package recipes:

Poco/1.7.8p3@pocoproject/stable
Poco/1.7.9@pocoproject/stable
Poco/1.7.9p1@pocoproject/stable
Poco/1.7.9p2@pocoproject/stable
Poco/1.8.0.1@pocoproject/stable
Poco/1.8.0@pocoproject/stable
Poco/1.8.1@pocoproject/stable
Poco/1.9.0@pocoproject/stable
```

4. We got some interesting references for Poco. Let's inspect the metadata of the 1.9.0 version:

```
$ conan inspect Poco/1.9.0@pocoproject/stable
...
name: Poco
version: 1.9.0
url: http://github.com/pocoproject/conan-poco
license: The Boost Software License 1.0
author: None
description: Modern, powerful open source C++ class libraries for␣
↪building network- and internet-based applications that run on desktop,␣
↪server, mobile and embedded systems.
generators: ('cmake', 'txt')
exports: None
exports_sources: ('CMakeLists.txt', 'PocoMacros.cmake')
short_paths: False
apply_env: True
build_policy: None
```

5. Ok, it looks like this dependency could work with our Encrypter app. We should indicate which are the requirements and the generator for our build system. Let's create a *conanfile.txt* inside our project's folder with the following content:

Listing 2: **conanfile.txt**

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
cmake
```

In this example we are using CMake to build the project, which is why the `cmake` generator is specified. This generator creates a *conanbuildinfo.cmake* file that defines CMake variables including paths and library names that can be used in our build. Read more about *Generators*.

6. Next step: We are going to install the required dependencies and generate the information for the build system:

---

**Important:** If you are using **GCC compiler >= 5.1**, Conan will set the `compiler.libcxx` to the old ABI for backwards compatibility. You can change this with the following commands:

```
$ conan profile new default --detect  # Generates default profile␣
↪detecting GCC and sets old ABI
$ conan profile update settings.compiler.libcxx=libstdc++11 default  #␣
↪Sets libcxx to C++11 ABI
```

You will find more information in *How to manage the GCC >= 5 ABI*.

```
$ mkdir build && cd build
$ conan install ..
...
Requirements
    OpenSSL/1.0.2o@conan/stable from 'conan-center' - Downloaded
    Poco/1.9.0@pocoproject/stable from 'conan-center' - Cache
    zlib/1.2.11@conan/stable from 'conan-center' - Downloaded
Packages
    OpenSSL/1.0.2o@conan/stable:606fdb601e335c2001bdf31d478826b644747077 -
 ↪ Download
    Poco/1.9.0@pocoproject/
↪stable:09378ed7f51185386e9f04b212b79fe2d12d005c - Download
    zlib/1.2.11@conan/stable:6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7 -␣
↪Download

zlib/1.2.11@conan/stable: Retrieving package␣
↪6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7 from remote 'conan-center'
...
Downloading conan_package.tgz
[==================================================] 99.8KB/99.8KB
...
zlib/1.2.11@conan/stable: Package installed␣
↪6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7
OpenSSL/1.0.2o@conan/stable: Retrieving package␣
↪606fdb601e335c2001bdf31d478826b644747077 from remote 'conan-center'
...
Downloading conan_package.tgz
[==================================================] 5.5MB/5.5MB
...
OpenSSL/1.0.2o@conan/stable: Package installed␣
↪606fdb601e335c2001bdf31d478826b644747077
Poco/1.9.0@pocoproject/stable: Retrieving package␣
↪09378ed7f51185386e9f04b212b79fe2d12d005c from remote 'conan-center'
...
Downloading conan_package.tgz
[==================================================] 11.5MB/11.5MB
...
Poco/1.9.0@pocoproject/stable: Package installed␣
↪09378ed7f51185386e9f04b212b79fe2d12d005c
PROJECT: Generator cmake created conanbuildinfo.cmake
PROJECT: Generator txt created conanbuildinfo.txt
PROJECT: Generated conaninfo.txt
```

Conan installed our Poco dependency but also the **transitive dependencies** for it: OpenSSL and zlib. I has also generated a *conanbuildinfo.cmake* file for our build system.

7. Now let's create our build file. To inject the Conan information, include the generated *conanbuildinfo.cmake* file like this:

Listing 3: **CMakeLists.txt**

```
cmake_minimum_required(VERSION 2.8.12)
project(MD5Encrypter)

add_definitions("-std=c++11")
```

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```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()

add_executable(md5 md5.cpp)
target_link_libraries(md5 ${CONAN_LIBS})
```

8. Now we are ready to build and run our Encrypter app:

```
(win)
$ cmake .. -G "Visual Studio 15 Win64"
$ cmake --build . --config Release

(linux, mac)
$ cmake .. -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release
$ cmake --build .
...
[100%] Built target md5
$ ./bin/md5
c3fcd3d76192e4007dfb496cca67e13b
```

## 3.2 Installing Dependencies

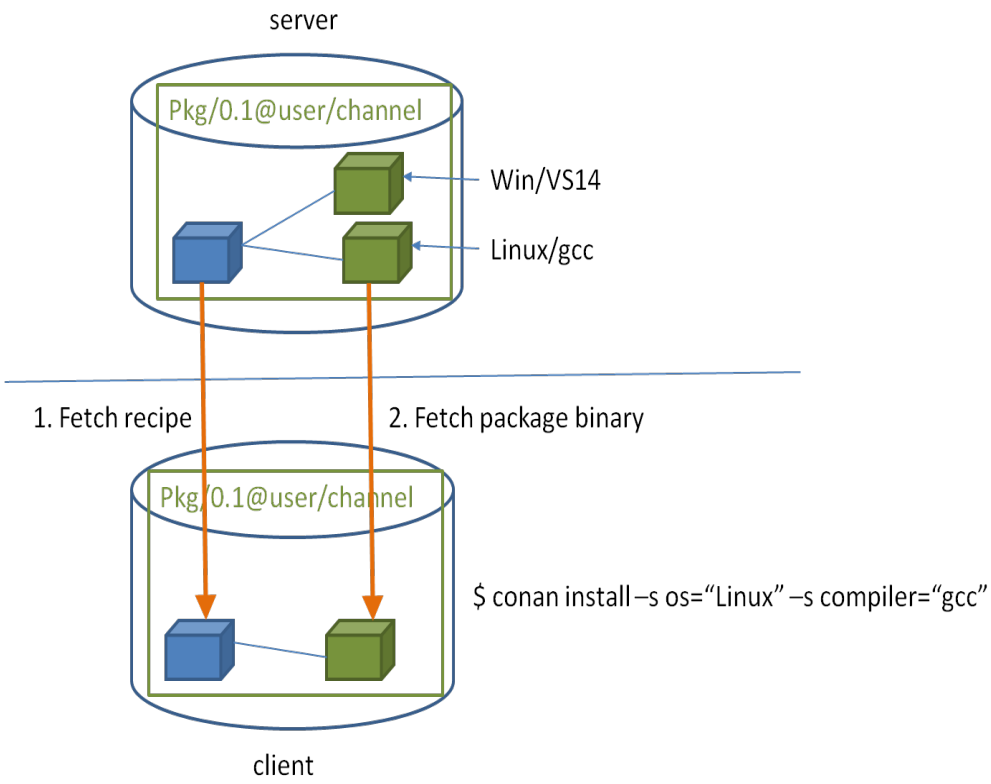
The **conan install** command downloads the binary package required for your configuration (detected the first time you ran the command), **together with other (transitively required by Poco) libraries, like OpenSSL and Zlib**. It will also create the *conanbuildinfo.cmake* file in the current directory, in which you can see the CMake variables, and a *conaninfo.txt* in which the settings, requirements and optional information is saved.

---

**Note:** Conan generates a *default profile* with your detected settings (OS, compiler, architecture...) and that configuration is printed at the top of every **conan install** command. However, it is strongly recommended to review it and adjust the settings to accurately describe your system as shown in the *Building with Other Configurations* section.

---

It is very important to understand the installation process. When the **conan install** command runs, settings specified on the command line or taken from the defaults in *<userhome>/.conan/profiles/default* file are applied.




For example, the command **`conan install . --settings os="Linux" --settings compiler="gcc"`**, performs these steps:

- Checks if the package recipe (for `Poco/1.9.0@pocoproject/stable` package) exists in the local cache. If we are just starting, the cache is empty.
- Looks for the package recipe in the defined remotes. Conan comes with conan-center Bintray remote as the default, but can be changed.
- If the recipe exists, the Conan client fetches and stores it in your local cache.
- With the package recipe and the input settings (Linux, GCC), Conan looks for the corresponding binary in the local cache.
- Then Conan searches the corresponding binary package in the remote and fetches it.
- Finally, it generates an appropriate file for the build system specified in the `[generators]` section.

There are binaries for several mainstream compilers and versions available in Conan Center repository in Bintray, such as Visual Studio 14, 15, Linux GCC 4.9 and Apple Clang 3.5... Conan will throw an error if the binary package required for specific settings doesn't exist. You can build the binary package from sources using **`conan install --build=missing`**, it will succeed if your configuration is supported by the recipe. You will find more info in the *Building with Other Configurations* section.

## 3.3 Inspecting Dependencies

The retrieved packages are installed to your local user cache (typically *.conan/data*), and can be reused from this location for other projects. This allows to clean your current project and continue working even without network connection. To search for packages in the local cache run:

```
$ conan search "*"
Existing package recipes:

OpenSSL/1.0.2o@conan/stable
Poco/1.9.0@pocoproject/stable
zlib/1.2.11@conan/stable
```

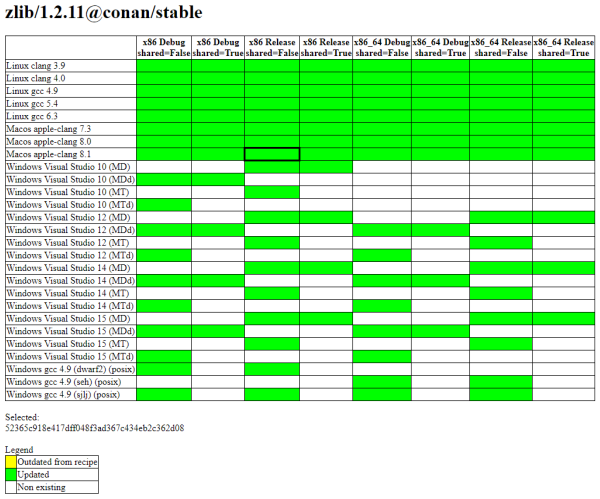
To inspect the different binary packages of a reference run:

```
$ conan search Poco/1.9.0@pocoproject/stable
Existing packages for recipe Poco/1.9.0@pocoproject/stable:

Package_ID: 09378ed7f51185386e9f04b212b79fe2d12d005c
    [options]
        cxx_14: False
        enable_apacheconnector: False
        enable_cppparser: False
        enable_crypto: True
        enable_data: True
...
```

There is also the possibility to generate a table for all package binaries available in a remote:

```
$ conan search zlib/1.2.11@conan/stable --table=file.html -r=conan-center
$ file.html # or open the file, double-click
```



**zlib/1.2.11@conan/stable**

| | x86 Debug shared=False | x86 Debug shared=True | x86 Release shared=False | x86 Release shared=True | x86_64 Debug shared=False | x86_64 Debug shared=True | x86_64 Release shared=False | x86_64 Release shared=True |
|---|---|---|---|---|---|---|---|---|
| Linux clang 3.9 | | | | | | | | |
| Linux clang 4.0 | | | | | | | | |
| Linux gcc 4.9 | | | | | | | | |
| Linux gcc 5.4 | | | | | | | | |
| Linux gcc 6.3 | | | | | | | | |
| Macos apple-clang 7.3 | | | | | | | | |
| Macos apple-clang 8.0 | | | | | | | | |
| Macos apple-clang 8.1 | | | | | | | | |
| Windows Visual Studio 10 (MD) | | | | | | | | |
| Windows Visual Studio 10 (MDd) | | | | | | | | |
| Windows Visual Studio 10 (MT) | | | | | | | | |
| Windows Visual Studio 10 (MTd) | | | | | | | | |
| Windows Visual Studio 12 (MD) | | | | | | | | |
| Windows Visual Studio 12 (MDd) | | | | | | | | |
| Windows Visual Studio 12 (MT) | | | | | | | | |
| Windows Visual Studio 12 (MTd) | | | | | | | | |
| Windows Visual Studio 14 (MD) | | | | | | | | |
| Windows Visual Studio 14 (MDd) | | | | | | | | |
| Windows Visual Studio 14 (MT) | | | | | | | | |
| Windows Visual Studio 14 (MTd) | | | | | | | | |
| Windows Visual Studio 15 (MD) | | | | | | | | |
| Windows Visual Studio 15 (MDd) | | | | | | | | |
| Windows Visual Studio 15 (MT) | | | | | | | | |
| Windows Visual Studio 15 (MTd) | | | | | | | | |
| Windows gcc 4.9 (dwarf2) (posix) | | | | | | | | |
| Windows gcc 4.9 (seh) (posix) | | | | | | | | |
| Windows gcc 4.9 (sjlj) (posix) | | | | | | | | |

Selected:
52365c918e417dff048f3ad367c434eb2c362d08

Legend

| |
|---|
| Outdated from recipe |
| Updated |
| Non existing |

To inspect all your current project's dependencies use the **conan info** command by pointing it to the location of the *conanfile.txt* folder:

```
$ conan info ..
PROJECT
    ID: 6ecacba4f2b7535e0acb633a0cc4de0234445fea
    BuildID: None
    Requires:
        Poco/1.9.0@pocoproject/stable
OpenSSL/1.0.2o@conan/stable
    ID: 606fdb601e335c2001bdf31d478826b644747077
    BuildID: None
    Remote: conan-center=https://conan.bintray.com
```

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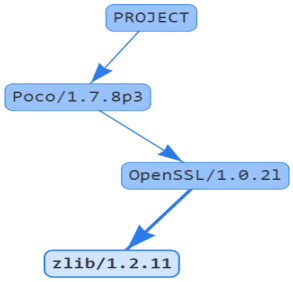
```
    URL: http://github.com/conan-community/conan-openssl
    License: The current OpenSSL licence is an 'Apache style' license: https://www.
↪openssl.org/source/license.html
    Recipe: Cache
    Binary: Cache
    Binary remote: conan-center
    Creation date: 2018-08-27 09:12:47
    Required by:
        Poco/1.9.0@pocoproject/stable
    Requires:
        zlib/1.2.11@conan/stable
Poco/1.9.0@pocoproject/stable
    ID: 09378ed7f51185386e9f04b212b79fe2d12d005c
    BuildID: None
    Remote: conan-center=https://conan.bintray.com
    URL: http://github.com/pocoproject/conan-poco
    License: The Boost Software License 1.0
    Recipe: Cache
    Binary: Cache
    Binary remote: conan-center
    Creation date: 2018-08-30 13:28:08
    Required by:
        PROJECT
    Requires:
        OpenSSL/1.0.2o@conan/stable
zlib/1.2.11@conan/stable
    ID: 6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7
    BuildID: None
    Remote: conan-center=https://conan.bintray.com
    URL: http://github.com/conan-community/conan-zlib
    License: Zlib
    Recipe: Cache
    Binary: Cache
    Binary remote: conan-center
    Creation date: 2018-10-24 12:40:49
    Required by:
        OpenSSL/1.0.2o@conan/stable
```

Or generate a graph of your dependencies using Dot or HTML formats:

```
$ conan info .. --graph=file.html
$ file.html # or open the file, double-click
```



## 3.4 Searching Packages

The remote repository where packages are installed from is configured by default in Conan. It is called Conan Center (configured as **conan-center** remote) and it is located in Bintray.

You can search packages in Conan Center using this command:

```
$ conan search "*" --remote=conan-center
Existing package recipes:

Assimp/4.1.0@jacmoe/stable
CLI11/1.6.1@cliutils/stable
CTRE/2.1@ctre/stable
Catch/1.12.1@bincrafters/stable
Expat/2.2.5@pix4d/stable
FakeIt/2.0.5@gasuketsu/stable
IlmBase/2.2.0@Mikayex/stable
IrrXML/1.2@conan/stable
OpenSSL/1.0.2@conan/stable
...
```

There are additional community repositories that can be configured and used. See *Bintray Repositories* for more information.

## 3.5 Building with Other Configurations

In this example, we have built our project using the default configuration detected by Conan. This configuration is known as the *default profile*.

A profile needs to be available prior to running commands such as **conan install**. When running the command, your settings are automatically detected (compiler, architecture...) and stored as the default profile. You can edit these settings *~/.conan/profiles/default* or create new profiles with your desired configuration.

For example, if we have a profile with a 32-bit GCC configuration in a profile called *gcc_x86*, we can run the following:

```
$ conan install . --profile=gcc_x86
```

**Tip:** We strongly recommend using *Profiles* and managing them with *conan config install*.

However, the user can always override the default profile settings in the **conan install** command using the **--settings** parameter. As an exercise, try building the Encrypter project 32-bit version:

```
$ conan install . --profile=gcc_x86 --settings arch=x86_64
```

The above command installs a different package, using the **--settings arch=x86** instead of the one of the profile used previously.

To use the 32-bit binaries, you will also have to change your project build:

- In Windows, change the CMake invocation to `Visual Studio 14`.
- In Linux, you have to add the `-m32` flag to your `CMakeLists.txt` by running `SET(CMAKE_CXX_FLAGS "${CMAKE_CXX_FLAGS} -m32")`, and the same applies to `CMAKE_C_FLAGS`, `CMAKE_SHARED_LINK_FLAGS` and `CMAKE_EXE_LINKER_FLAGS`. This can also be done more easily, by automatically using Conan, as we'll show later.

- In macOS, you need to add the definition `-DCMAKE_OSX_ARCHITECTURES=i386`.

Got any doubts? Check our *FAQ*, or join the community in Cpplang Slack `#conan` channel!

CHAPTER

FOUR

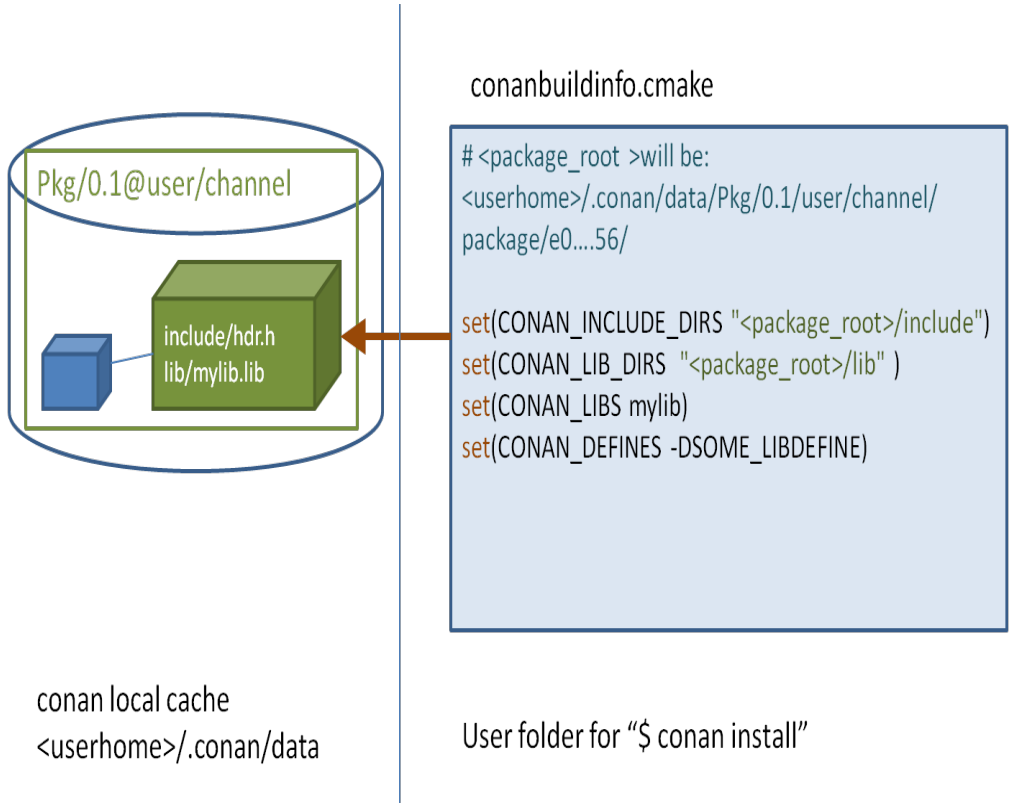
# USING PACKAGES

This section shows how to setup your project and manage dependencies (i.e., install existing packages) with Conan.

## 4.1 Installing dependencies

In *Getting started* we used the **conan install** command to download the **Poco** library and build an example.

If you inspect the `conanbuildinfo.cmake` file that was created when running **conan install**, you can see there that there are many CMake variables declared. For example `CONAN_INCLUDE_DIRS_ZLIB`, that defines the include path to the zlib headers, and `CONAN_INCLUDE_DIRS` that defines include paths for all dependencies headers.




If you check the full path that each of these variables defines, you will see that it points to a folder under your `<userhome>` folder. Together, these folders are the **local cache**. This is where package recipes and binary packages are stored and cached, so they don't have to be retrieved again. You can inspect the **local cache** with **conan search**, and remove packages from it with **conan remove** command.

If you navigate to the folders referenced in `conanbuildinfo.cmake` you will find the headers and libraries for each package.

If you execute a **`conan install Poco/1.9.0@pocoproject/stable`** command in your shell, Conan will download the Poco package and its dependencies (*OpenSSL/1.0.2l@conan/stable* and *zlib/1.2.11@conan/stable*) to your local cache and print information about the folder where they are installed. While you can handle them manually, the recommended approach is to use a `conanfile.txt`.

### 4.1.1 Requires

The required dependencies should be specified in the **[requires]** section. Here is an example:

```
[requires]
Poco/1.9.0@pocoproject/stable
```

Where:

- `Poco` is the name of the package which is usually the same as the project/library.
- `1.9.0` is the version which usually matches that of the packaged project/library. This can be any string; it does not have to be a number, so, for example, it could indicate if this is a "develop" or "master" version. Packages can be overwritten, so it is also OK to have packages like "nightly" or "weekly", that are regenerated periodically.
- `pocoproject` is the owner of this package version. It is basically a namespace that allows different users to have their own packages for the same library with the same name, and interchange them. So, for example, you can upload a certain library under your own user name, and later the same packages can be uploaded, without modifications, to another official group or company username.
- `stable` is the channel. Channels provide another way to have different variants of packages for the same library and use them interchangeably. They usually denote the maturity of the package as an arbitrary string such as "stable" or "testing", but they can be used for any purpose such as package revisions (e.g., the library version has not changed, but the package recipe has evolved).

#### Overriding requirements

You can specify multiple requirements and **override** transitive "require's requirements". In our example, Conan installed the Poco package and all its requirements transitively:

- **OpenSSL/1.0.2l@conan/stable**
- **zlib/1.2.11@conan/stable**

---

**Tip:** This is a good example of overriding requirements given the importance of keeping the OpenSSL library updated.

---

Consider that a new release of the OpenSSL library has been released, and a new corresponding Conan package is available. In our example, we do not need to wait until pocoproject (the author) generates a new package of POCO that includes the new OpenSSL library.

We can simply enter the new version in **[requires]** section:

```
[requires]
Poco/1.9.0@pocoproject/stable
OpenSSL/1.0.2p@conan/stable
```

The second line will override the OpenSSL/1.0.2l required by POCO with the currently non-existent **OpenSSL/1.0.2p**.

Another example in which we may want to try some new zlib alpha features, we could replace the zlib requirement with one from another user or channel.

```
[requires]
Poco/1.9.0@pocoproject/stable
OpenSSL/1.0.2p@conan/stable
zlib/1.2.11@otheruser/alpha
```

### 4.1.2 Generators

Conan reads the **[generators]** section from `conanfile.txt` and creates files for each generator with all the information needed to link your program with the specified requirements. The generated files are usually temporary, created in build folders and not committed to version control, as they have paths to local folders that will not exist in another machine. Moreover, it is very important to highlight that generated files match the given configuration (Debug/Release, x86/x86_64, etc) specified when running **`conan install`**. If the configuration changes, the files will change accordingly.

For a full list of generators, please refer to the complete *generators* reference.

### 4.1.3 Options

We have already seen that there are some **settings** that can be specified during installation. For example, **`conan install . -s build_type=Debug`**. These settings are typically a project-wide configuration defined by the client machine, so they cannot have a default value in the recipe. For example, it doesn't make sense for a package recipe to declare "Visual Studio" as a default compiler because that is something defined by the end consumer, and unlikely to make sense if they are working in Linux.

On the other hand, **options** are intended for package specific configuration that can be set to a default value in the recipe. For example, one package can define that its default linkage is static, and this is the linkage that should be used if consumers don't specify otherwise.

---

**Note:** You can see the available options for a package by inspecting the recipe with **`conan get <reference>`** command:

```
$ conan get Poco/1.9.0@pocoproject/stable
```

To see only specific fields of the recipe you can use the **`conan inspect`** command instead:

```
$ conan inspect Poco/1.9.0@pocoproject/stable -a=options
$ conan inspect Poco/1.9.0@pocoproject/stable -a=default_options
```

---

For example, we can modify the previous example to use dynamic linkage instead of the default one, which was static, by editing the *conanfile.txt*:

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
cmake

[options]
```

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```
Poco:shared=True # PACKAGE:OPTION=VALUE
OpenSSL:shared=True
```

Install the requirements and compile from the build folder (change the CMake generator if not in Windows):

```
$ conan install ..
$ cmake .. -G "Visual Studio 14 Win64"
$ cmake --build . --config Release
```

As an alternative to defining options in the `conanfile.txt` file, you can specify them directly in the command line:

```
$ conan install .. -o Poco:shared=True -o OpenSSL:shared=True
# or even with wildcards, to apply to many packages
$ conan install .. -o *:shared=True
```

Conan will install the binaries of the shared library packages, and the example will link with them. You can again inspect the different binaries installed. For example, **`conan search zlib/1.2.8@lasote/stable`**.

Finally, launch the executable:

```
$ ./bin/timer
```

What happened? It fails because it can't find the shared libraries in the path. Remember that shared libraries are used at runtime, so the operating system, which is running the application, must be able to locate them.

We could inspect the generated executable, and see that it is using the shared libraries. For example, in Linux, we could use the *objdump* tool and see the *Dynamic section*:

```
$ cd bin
$ objdump -p timer
...
Dynamic Section:
 NEEDED               libPocoUtil.so.31
 NEEDED               libPocoXML.so.31
 NEEDED               libPocoJSON.so.31
 NEEDED               libPocoMongoDB.so.31
 NEEDED               libPocoNet.so.31
 NEEDED               libPocoCrypto.so.31
 NEEDED               libPocoData.so.31
 NEEDED               libPocoDataSQLite.so.31
 NEEDED               libPocoZip.so.31
 NEEDED               libPocoFoundation.so.31
 NEEDED               libpthread.so.0
 NEEDED               libdl.so.2
 NEEDED               librt.so.1
 NEEDED               libssl.so.1.0.0
 NEEDED               libcrypto.so.1.0.0
 NEEDED               libstdc++.so.6
 NEEDED               libm.so.6
 NEEDED               libgcc_s.so.1
 NEEDED               libc.so.6
```

### 4.1.4 Imports

There are some differences between shared libraries on Linux (*.so), Windows (*.dll) and MacOS (*.dylib). The shared libraries must be located in a folder where they can be found, either by the linker, or by the OS runtime.

You can add the libraries' folders to the path (dynamic linker LD_LIBRARY_PATH path in Linux, DYLD_LIBRARY_PATH in OSX, or system PATH in Windows), or copy those shared libraries to some system folder where they can be found by the OS. But these operations are are typical operations deployments or final installation of apps; they are not desired during development, and Conan is intended for developers, so it avoids manipulations on the OS.

In Windows and OSX, the simplest approach is to copy the shared libraries to the executable folder, so they are found by the executable, without having to modify the path.

This is done using the **[imports]** section in `conanfile.txt`.

To demonstrate this, edit the `conanfile.txt` file and paste the following **[imports]** section:

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
cmake

[options]
Poco:shared=True
OpenSSL:shared=True

[imports]
bin, *.dll -> ./bin # Copies all dll files from packages bin folder to my "bin" folder
lib, *.dylib* -> ./bin # Copies all dylib files from packages lib folder to my "bin"␣
↪folder
```

**Note:** You can explore the package folder in your local cache (~/.conan/data) and see where the shared libraries are. It is common that ***.dll** are copied to **/bin**. The rest of the libraries should be found in the **/lib** folder, however, this is just a convention, and different layouts are possible.

Install the requirements (from the `mytimer/build` folder), and run the binary again:

```
$ conan install ..
$ ./bin/timer
```

Now look at the `mytimer/build/bin` folder and verify that the required shared libraries are there.

As you can see, the **[imports]** section is a very generic way to import files from your requirements to your project.

This method can be used for packaging applications and copying the resulting executables to your bin folder, or for copying assets, images, sounds, test static files, etc. Conan is a generic solution for package management, not only (but focused in) for C/C++ or libraries.

**See also:**

To learn more about working with shared libraries, please refer to *Howtos/Manage shared libraries*.

## 4.2 Using profiles

So far, we have used the default settings stored in `~/.conan/profiles/default` and defined as command line arguments.

However, in large projects, configurations can get complex, settings can be very different, and we need an easy way to switch between different configurations with different settings, options etc,. An easy way to switch between configurations is by using profiles.

A profile file contains a predefined set of `settings`, `options`, `environment variables`, and `build_requires` specified in the following structure:

```
[settings]
setting=value

[options]
MyLib:shared=True

[env]
env_var=value

[build_requires]
Tool1/0.1@user/channel
Tool2/0.1@user/channel, Tool3/0.1@user/channel
*: Tool4/0.1@user/channel
```

Options allow the use of wildcards letting you apply the same option value to many packages. For example:

```
[options]
*:shared=True
```

Here is an example of a configuration that a profile file may contain:

Listing 1: *clang_3.5*

```
 [settings]
 os=Macos
 arch=x86_64
 compiler=clang
 compiler.version=3.5
 compiler.libcxx=libstdc++11
 build_type=Release

 [env]
 CC=/usr/bin/clang
 CXX=/usr/bin/clang++
```

A profile file can be stored in the default profile folder, or anywhere else in your project file structure. To use the configuration specified in a profile file, pass in the file as a command line argument as shown in the example below:

```
$ conan create . demo/testing -pr=clang_3.5
```

Continuing with the example of Poco, instead of passing in a long list of command line arguments, we can define a handy profile that defines them all and pass that to the command line when installing the different project dependencies.

A profile to install dependencies as **shared** and in **debug** mode would look like this:

Listing 2: *debug_shared*

```
include(default)

[settings]
build_type=Debug

[options]
Poco:shared=True
Poco:enable_apacheconnector=False
OpenSSL:shared=True
```

To install dependencies using the profile file, we would use:

```
$ conan install . -pr=debug_shared
```

We could also create a new profile to use a different compiler version and store that in our project directory. For example:

Listing 3: *poco_clang_3.5*

```
include(clang_3.5)

[options]
Poco:shared=True
Poco:enable_apacheconnector=False
OpenSSL:shared=True
```

To install dependencies using this new profile, we would use:

```
$ conan install . -pr=./poco_clang_3.5
```

**See also:**

Read more about *Profiles* for full reference. There is a conan command, *conan profile*, that can help inspecting and managing profiles. Profiles can be also shared and installed with the *conan config install* command.

## 4.3 Workflows

This section summarizes some possible layouts and workflows when using Conan together with other tools as an end-user for installing and consuming existing packages. To create your own packages, please refer to *Creating Packages*.

Whether you are working on a single configuration or a multi configuration project, in both cases, the recommended approach is to have a conanfile (either .py or .txt) at the root of your project.

### 4.3.1 Single configuration

When working with a single configuration, your conanfile will be quite simple as shown in the examples and tutorials we have used so far in this user guide. For example, in *Getting started*, we showed how you can run the **`conan install ..`** command inside the *build* folder resulting in the *conaninfo.txt* and *conanbuildinfo.cmake* files being generated there too. Note that the build folder is temporary, so you should exclude it from version control to exclude these temporary files.

**Out-of-source builds** are also supported. Let's look at a simple example:

```
$ git clone https://github.com/memsharded/example-poco-timer
$ conan install ./example-poco-timer --install-folder=example-poco-build
```

This will result in the following layout:

```
example-poco-build
    conaninfo.txt
    conanbuildinfo.txt
    conanbuildinfo.cmake
example-poco-timer
    CMakeLists.txt  # If using cmake, but can be Makefile, sln...
    LICENSE
    README.md
    conanfile.txt
    timer.cpp
```

Now you are ready to build:

```
$ cd example-poco-build
$ cmake ../example-poco-timer -G "Visual Studio 15 Win64"  # or other generator
$ cmake --build . --config Release
$ ./bin/timer
```

We have created a separate build configuration of the project without affecting the original source directory in any way. The benefit is that we can freely experiment with the configuration: We can clear the build folder and build another. For example, changing the build type to Debug:

```
$ rm -rf *
$ conan install ../example-poco-timer -s build_type=Debug
$ cmake ../example-poco-timer -G "Visual Studio 15 Win64"
$ cmake --build . --config Debug
$ ./bin/timer
```

### 4.3.2 Multi configuration

You can also manage different configurations, whether in-source or out of source, and switch between them without having to re-issue the **conan install** command (Note however, that even if you did have to run **conan install** again, since subsequent runs use the same parameters, they would be very fast since packages would already have been installed in the local cache rather than in the project)

```
$ git clone https://github.com/memsharded/example-poco-timer
$ conan install example-poco-timer -s build_type=Debug -if example-poco-build/debug
$ conan install example-poco-timer -s build_type=Release -if example-poco-build/
↪release

$ cd example-poco-build/debug && cmake ../../example-poco-timer -G "Visual Studio 15␣
↪Win64" && cd ../..
$ cd example-poco-build/release && cmake ../../example-poco-timer -G "Visual Studio␣
↪15 Win64" && cd ../..
```

**Note:** You can either use the `--install-folder` or `-if` flags to specify where to generate the output files, or manually create the output directory and navigate to it before executing the **conan install** command.

So the layout will be:

```
example-poco-build
  debug
      conaninfo.txt
      conanbuildinfo.txt
      conanbuildinfo.cmake
      CMakeCache.txt # and other cmake files
  release
      conaninfo.txt
      conanbuildinfo.txt
      conanbuildinfo.cmake
      CMakeCache.txt # and other cmake files
example-poco-timer
    CMakeLists.txt  # If using cmake, but can be Makefile, sln...
    LICENSE
    README.md
    conanfile.txt
    timer.cpp
```

Now you can switch between your build configurations in exactly the same way you do for CMake or other build systems, by moving to the folder in which the build configuration is located, because the Conan configuration files for that build configuration will also be there.

```
$ cd example-poco-build/debug && cmake --build . --config Debug && cd ../..
$ cd example-poco-build/release && cmake --build . --config Release && cd ../..
```

Note that the CMake `include()` of your project must be prefixed with the current cmake binary directory, otherwise it will not find the necessary file:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()
```

**See also:**

There are two generators, `cmake_multi` and `visual_studio_multi` that could help to avoid the context switch and using Debug and Release configurations simultaneously. Read more about them in *cmake_multi* and *visual_studio_multi*

CHAPTER

FIVE

# CREATING PACKAGES

This section shows how to create, build and test your packages.

## 5.1 Getting Started

To start learning about creating packages, we will create a package from the existing source code repository: https://github.com/memsharded/hello. You can check that project, it is a very simple "hello world" C++ library, using CMake as the build system to build a library and an executable. It does not contain any association with Conan.

We are using a similar GitHub repository as an example, but the same process also applies to other source code origins, like downloading a zip or tarball from the internet.

**Note:** For this concrete example you will need, besides a C++ compiler, both *CMake* and *git* installed and in your path. They are not required by conan, so you could use your own build system and version control instead.

### 5.1.1 Creating the Package Recipe

First, let's create a folder for our package recipe, and use the **conan new** helper command that will create a working package recipe for us:

```
$ mkdir mypkg && cd mypkg
$ conan new Hello/0.1 -t
```

This will generate the following files:

```
conanfile.py
test_package
  CMakeLists.txt
  conanfile.py
  example.cpp
```

On the root level, there is a *conanfile.py* which is the main recipe file, responsible for defining our package. Also, there is a *test_package* folder, which contains a simple example consuming project that will require and link with the created package. It is useful to make sure that our package is correctly created.

Let's have a look at the root package recipe *conanfile.py*:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
```

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```
    name = "Hello"
    version = "0.1"
    license = "<Put the package license here>"
    url = "<Package recipe repository url here, for issues about the package>"
    description = "<Description of Hello here>"
    settings = "os", "compiler", "build_type", "arch"
    options = {"shared": [True, False]}
    default_options = {"shared": False}
    generators = "cmake"

    def source(self):
        self.run("git clone https://github.com/memsharded/hello.git")
        self.run("cd hello && git checkout static_shared")
        # This small hack might be useful to guarantee proper /MT /MD linkage
        # in MSVC if the packaged project doesn't have variables to set it
        # properly
        tools.replace_in_file("hello/CMakeLists.txt", "PROJECT(MyHello)",
                              '''PROJECT(MyHello)
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()''')

    def build(self):
        cmake = CMake(self)
        cmake.configure(source_folder="hello")
        cmake.build()

        # Explicit way:
        # self.run('cmake %s/hello %s'
        #          % (self.source_folder, cmake.command_line))
        # self.run("cmake --build . %s" % cmake.build_config)

    def package(self):
        self.copy("*.h", dst="include", src="hello")
        self.copy("*hello.lib", dst="lib", keep_path=False)
        self.copy("*.dll", dst="bin", keep_path=False)
        self.copy("*.so", dst="lib", keep_path=False)
        self.copy("*.dylib", dst="lib", keep_path=False)
        self.copy("*.a", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["hello"]
```

This is a complete package recipe. Without going into detail, these are the basics:

- The `settings` field defines the configuration of the different binary packages. In this example, we defined that any change to the OS, compiler, architecture or build type will generate a different binary package. Please note that Conan generates different binary packages for different introduced configuration (in this case settings) for the same recipe.

  Note that the platform on which the recipe is running and the package being built differ from the final platform where the code will be running (`self.settings.os` and `self.settings.arch`) if the package is being cross-built. So if you want to apply a different build depending on the current build machine, you need to check it:

```
def build(self):
    if platform.system() == "Windows":
        cmake = CMake(self)
```

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```
        cmake.configure(source_folder="hello")
        cmake.build()
    else:
        env_build = AutoToolsBuildEnvironment(self)
        env_build.configure()
        env_build.make()
```

Learn more in the *Cross building* section.

- This package recipe is also able to create different binary packages for static and shared libraries with the `shared` option, which is set by default to `False` (i.e. by default it will use static linkage).
- The `source()` method executes a **`git clone`** to retrieve the sources from Github. Other origins, such as downloading a zip file are also available. As you can see, any manipulation of the code can be done, such as checking out any branch or tag, or patching the source code. In this example, we are adding two lines to the existing CMake code, to ensure binary compatibility. Don't worry about it now, we'll deal with it later.
- The `build()` configures the project, and then proceeds to build it using standard CMake commands. The `CMake` object just assists to translate the Conan settings to CMake command line arguments. Please note that **CMake is not strictly required**. You can build packages directly by invoking **make**, **MSBuild**, **SCons** or any other build system.

  **See also:**

  Check the *existing build helpers*.
- The `package()` method copies artifacts (headers, libs) from the build folder to the final package folder.
- Finally, the `package_info()` method defines that the consumer must link with the "hello" library when using this package. Other information as include or lib paths can be defined as well. This information is used for files created by generators to be used by consumers, as *conanbuildinfo.cmake*.

---

**Note:** When writing your own *conanfile.py* references, please bear in mind that you should follow the rules in *conanfile.py*

---

### 5.1.2 The test_package Folder

---

**Note:** The **test_package** differs from the library unit or integration tests, which should be more comprehensive. These tests are "package" tests, and validate that the package is properly created, and that the package consumers will be able to link against it and reuse it.

---

If you look at the `test_package` folder, you will realize that the `example.cpp` and the `CMakeLists.txt` files don't have unique characteristics. The *test_package/conanfile.py* file is just another recipe, that can be perceived as a consumer *conanfile.txt* that has been displayed in previous sections:

```
from conans import ConanFile, CMake
import os

class HelloTestConan(ConanFile):
    settings = "os", "compiler", "build_type", "arch"
    generators = "cmake"

    def build(self):
```

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```
        cmake = CMake(self)
        cmake.configure()
        cmake.build()

    def imports(self):
        self.copy("*.dll", dst="bin", src="bin")
        self.copy("*.dylib*", dst="bin", src="lib")

    def test(self):
        os.chdir("bin")
        self.run(".%sexample" % os.sep)
```

The *conanfile.py* described above has the following characteristics:

- It doesn't have a name and version, as we are not creating a package so they are not necessary.
- The `package()` and `package_info()` methods are not required since we are not creating a package.
- The `test()` method specifies which binaries need to run.
- The `imports()` method is set to copy the shared libraries to the `bin` folder. When dynamic linking is applied, and the `test()` method launches the `example` executable, they are found causing the `example` to run.

**Note:** An important difference with respect to standard package recipes is that you don't have to declare a `requires` attribute to depend on the tested `Hello/0.1@demo/testing` package as the `requires` will automatically be injected by Conan during the run. However, if you choose to declare it explicitly, it will work, but you will have to remember to bump the version, and possibly also the user and channel if you decide to change them.

### 5.1.3 Creating and Testing Packages

You can create and test the package with our default settings simply by running:

```
$ conan create . demo/testing
...
Hello world!
```

If "Hello world!" is displayed, it worked.

The **`conan create`** command does the following:

- Copies ("export" in conan terms) the *conanfile.py* from the user folder into the **local cache**.
- Installs the package, forcing it to be built from the sources.
- Moves to the *test_package* folder and creates a temporary *build* folder.
- Executes the **`conan install ..`**, to install the requirements of the *test_package/conanfile.py*. Note that it will build "Hello" from the sources.
- Builds and launches the *example* consuming application, calling the *test_package/conanfile.py* `build()` and `test()` methods respectively.

Using Conan commands, the **`conan create`** command would be equivalent to:

```
$ conan export . demo/testing
$ conan install Hello/0.1@demo/testing --build=Hello
```

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```
# package is created now, use test to test it
$ conan test test_package Hello/0.1@demo/testing
```

The **conan create** command receives the same command line parameters as **conan install** so you can pass to it the same settings, options, and command line switches. If you want to create and test packages for different configurations, you could:

```
$ conan create . demo/testing -s build_type=Debug
$ conan create . demo/testing -o Hello:shared=True -s arch=x86
$ conan create . demo/testing -pr my_gcc49_debug_profile
...
$ conan create ...
```

### 5.1.4 Settings vs. Options

We have used settings such as `os`, `arch` and `compiler`. Note the above package recipe also contains a `shared` option (defined as `options = {"shared": [True, False]}`). What is the difference between settings and options?

**Settings** are a project-wide configuration, something that typically affects the whole project that is being built. For example, the operating system or the architecture would be naturally the same for all packages in a dependency graph, linking a Linux library for a Windows app, or mixing architectures is impossible.

Settings cannot be defaulted in a package recipe. A recipe for a given library cannot say that its default is `os=Windows`. The `os` will be given by the environment in which that recipe is processed. It is a mandatory input.

Settings are configurable. You can edit, add, remove settings or subsettings in your *settings.yml* file. See *the settings.yml reference*.

On the other hand, **options** are a package-specific configuration. Static or shared library are not settings that apply to all packages. Some can be header only libraries while others packages can be just data, or package executables. Packages can contain a mixture of different artifacts. `shared` is a common option, but packages can define and use any options they want.

Options are defined in the package recipe, including their supported values, while other can be defaulted by the package recipe itself. A package for a library can well define that by default it will be a static library (a typical default). If not specified other. the package will be static.

There are some exceptions to the above. For example, settings can be defined per-package using the command line:

```
$ conan install . -s MyPkg:compiler=gcc -s compiler=clang ..
```

This will use `gcc` for MyPkg and `clang` for the rest of the dependencies (extremely rare case).

There are situations whereby many packages use the same option, thereby allowing you to set it's value once using patterns, like:

```
$ conan install . -o *:shared=True
```

Any doubts? Please check out our *FAQ section* or .

## 5.2 Recipe and Sources in a Different Repo

In the previous section, we fetched the sources of our library from an external repository. It is a typical workflow for packaging third party libraries.

There are two different ways to fetch the sources from an external repository:

1. Using the `source()` method as we displayed in the previous section:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
    ...

    def source(self):
        self.run("git clone https://github.com/memsharded/hello.git")
        self.run("cd hello && git checkout static_shared")
        ...
```

You can also use the *tools.Git* class:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
    ...

    def source(self):
        git = tools.Git(folder="hello")
        git.clone("https://github.com/memsharded/hello.git", "static_shared")
        ...
```

2. Using the *scm attribute* of the ConanFile [EXPERIMENTAL]:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
     scm = {
        "type": "git",
        "subfolder": "hello",
        "url": "https://github.com/memsharded/hello.git",
        "revision": "static_shared"
     }
    ...
```

Conan will clone the `scm url` and will checkout the `scm revision`. Head to *creating package documentation* to know more details about SCM feature.

The `source()` method will be called after the checkout process, so you can still use it to patch something or retrieve more sources, but it is not necessary in most cases.

## 5.3 Recipe and Sources in the Same Repo

Sometimes it is more convenient to have the recipe and source code together in the same repository. This is true especially if you are developing and packaging your own library, and not one from a third-party.

There are two different approaches:

- **Using the *exports sources attribute* of the conanfile to** export the source code together with the recipe. This way the recipe is self-contained and will not need to fetch the code from external origins when building from sources. It can be considered a "snapshot" of the source code.
- Using the *scm attribute* of the conanfile to capture the remote and commit of your repository automatically.

### 5.3.1 Exporting the Sources with the Recipe: `exports_sources`

This could be an appropriate approach if we want the package recipe to live in the same repository as the source code it is packaging.

First, let's get the initial source code and create the basic package recipe:

```
$ conan new Hello/0.1 -t -s
```

A *src* folder will be created with the same "hello" source code as in the previous example. You can have a look at it and see that the code is straightforward.

Now let's have a look at *conanfile.py*:

```
from conans import ConanFile, CMake

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    license = "<Put the package license here>"
    url = "<Package recipe repository url here, for issues about the package>"
    description = "<Description of Hello here>"
    settings = "os", "compiler", "build_type", "arch"
    options = {"shared": [True, False]}
    default_options = {"shared": False}
    generators = "cmake"
    exports_sources = "src/*"

    def build(self):
        cmake = CMake(self)
        cmake.configure(source_folder="src")
        cmake.build()

        # Explicit way:
        # self.run('cmake "%s/src" %s' % (self.source_folder, cmake.command_line))
        # self.run("cmake --build . %s" % cmake.build_config)

    def package(self):
        self.copy("*.h", dst="include", src="src")
        self.copy("*.lib", dst="lib", keep_path=False)
        self.copy("*.dll", dst="bin", keep_path=False)
        self.copy("*.dylib*", dst="lib", keep_path=False)
        self.copy("*.so", dst="lib", keep_path=False)
        self.copy("*.a", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["hello"]
```

There are two important changes:

- Added the `exports_sources` field, indicating to Conan to copy all the files from the local *src* folder into the package recipe.

- Removed the `source()` method, since it is no longer necessary to retrieve external sources.

Also, you can notice the two CMake lines:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()
```

They are not added in the package recipe, as they can be directly added to the `src/CMakeLists.txt` file.

And simply create the package for user and channel **demo/testing** as described previously:

```
$ conan create . demo/testing
...
Hello/0.1@demo/testing test package: Running test()
Hello world!
```

### 5.3.2 Capturing the Remote and Commit: `scm` [EXPERIMENTAL]

You can use the *scm attribute* with the `url` and `revision` field set to `auto`. When you export the recipe (or when `conan create` is called) the exported recipe will capture the remote and commit of the local repository:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
    scm = {
        "type": "git",  # Use "type": "svn", if local repo is managed using SVN
        "subfolder": "hello",
        "url": "auto",
        "revision": "auto"
    }
    ...
```

You can commit and push the `conanfile.py` to your origin repository, which will always preserve the "auto" values. But when the file is exported to the conan local cache, the copied recipe in the local cache will point to the captured remote and commit:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
    scm = {
        "type": "git",
        "subfolder": "hello",
        "url": "https://github.com/memsharded/hello.git",
        "revision": "437676e15da7090a1368255097f51b1a470905a0"
    }
    ...
```

So when you *upload the recipe* to a conan remote, the recipe will contain the "absolute" URL and commit.

When you are requiring your `HelloConan`, the `conan install` will retrieve the recipe from the remote. If you are building the package, the source code will be fetched from the captured url/commit.

---

**Tip:** While you are in the same computer (the same conan cache), even when you have exported the recipe and Conan has captured the absolute url and commit, Conan will store the local folder where your source code lives. If you build your package locally, it will use the local repository (in the local folder) instead of the remote URL, even if the local

directory contains uncommitted changes. This allows you to speed up the development of your packages when cloning from a local repository.

## 5.4 Packaging Existing Binaries

There are specific scenarios in which it is necessary to create packages from existing binaries, for example from 3rd parties or binaries previously built by another process or team that are not using Conan. Under these circumstances building from sources is not what you want. You should package the local files in the following situations:

- When you cannot build the packages from sources (when only pre-built binaries are available).
- When you are developing your package locally and you want to export the built artifacts to the local cache. As you don't want to rebuild again (clean copy) your artifacts, you don't want to call **conan create**. This method will keep your build cache if you are using an IDE or calling locally to the **conan build** command.

### 5.4.1 Packaging Pre-built Binaries

Running the `build()` method, when the files you want to package are local, results in no added value as the files copied from the user folder cannot be reproduced. For this scenario, run **conan export-pkg** command directly.

A Conan recipe is still required, but is very simple and will only include the package meta information. A basic recipe can be created with the **conan new** command:

```
$ conan new Hello/0.1 --bare
```

This will create and store the following package recipe in the local cache:

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"

    def package(self):
        self.copy("*")

    def package_info(self):
        self.cpp_info.libs = self.collect_libs()
```

The provided `package_info()` method scans the package files to provide end-users with the name of the libraries to link to. This method can be further customized to provide additional build flags (typically dependent on the settings). The default `package_info()` applies as follows: it defines headers in the "include" folder, libraries in the "lib" folder, and binaries in the "bin" folder. A different package layout can be defined in the `package_info()` method.

This package recipe can be also extended to provide support for more configurations (for example, adding options: shared/static, or using different settings), adding dependencies (`requires`), and more.

Based on the above, We can assume that our current directory contains a *lib* folder with a number binaries for this "hello" library *libhello.a*, compatible for example with Windows MinGW (gcc) version 4.9:

```
$ conan export-pkg . Hello/0.1@myuser/testing  -s os=Windows -s compiler=gcc -s␣
↪compiler.version=4.9 ...
```

Having a *test_package* folder is still highly recommended for testing the package locally before upload. As we don't want to build the package from the sources, the flow would be:

```
$ conan new Hello/0.1 --bare --test
# customize test_package project
# customize package recipe if necessary
$ cd my/path/to/binaries
$ conan export-pkg PATH/TO/conanfile.py Hello/0.1@myuser/testing  -s os=Windows -s␣
↪compiler=gcc -s compiler.version=4.9 ...
$ conan test PATH/TO/test_package/conanfile.py Hello/0.1@myuser/testing -s os=Windows␣
↪-s compiler=gcc -s ...
```

The last two steps can be repeated for any number of configurations.

### 5.4.2 Downloading and Packaging Pre-built Binaries

In this scenario, creating a complete Conan recipe, with the detailed retrieval of the binaries could be the preferred method, because it is reproducible, and the original binaries might be traced. Follow our sample recipe for this purpose:

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"

    def build(self):
        if self.settings.os == "Windows" and self.compiler == "Visual Studio":
            url = ("https://<someurl>/downloads/hello_binary%s_%s.zip"
                   % (str(self.settings.compiler.version), str(self.settings.build_
↪type)))
        elif ...:
            url = ...
        else:
            raise Exception("Binary does not exist for these settings")
        tools.get(url)

    def package(self):
        self.copy("*") # assume package as-is, but you can also copy specific files␣
↪or rearrange

    def package_info(self):  # still very useful for package consumers
        self.cpp_info.libs = ["hello"]
```

Typically, pre-compiled binaries come for different configurations, so the only task that the `build()` method has to implement is to map the `settings` to the different URLs.

---

**Note:**

- This is a standard Conan package even if the binaries are being retrieved from elsewhere. The **recommended approach** is to use **`conan create`**, and include a small consuming project in addition to the above recipe, to test locally and then proceed to upload the Conan package with the binaries to the Conan remote with **`conan upload`**.
- The same building policies apply. Having a recipe fails if no Conan packages are created, and the **`--build`** argument is not defined. A typical approach for this kind of packages could be to define a **`build_policy="missing"`**, especially if the URLs are also under the team control. If they are external (on the internet), it could be better to create the packages and store them on your own Conan server, so that the builds do not rely on third party URL being available.

---

## 5.5 Understanding Packaging

### 5.5.1 Creating and Testing Packages Manually

The previous **create** approach using *test_package* subfolder, is not strictly necessary, though **very strongly recommended**. If we didn't want to use the *test_package* functionality, we could just write our recipe ourselves or use the **`conan new`** command without the **`-t`**. command line argument.

```
$ mkdir mypkg && cd mypkg
$ conan new Hello/0.1
```

This will create just the *conanfile.py* recipe file. Now we can create our package:

```
$ conan create . demo/testing
```

This is equivalent to:

```
$ conan export . demo/testing
$ conan install Hello/0.1@demo/testing --build=Hello
```

Once the package is created, it can be consumed like any other package, by adding `Hello/0.1@demo/testing` to a project *conanfile.txt* or *conanfile.py* requirements and running:

```
$ conan install .
# build and run your project to ensure the package works
```

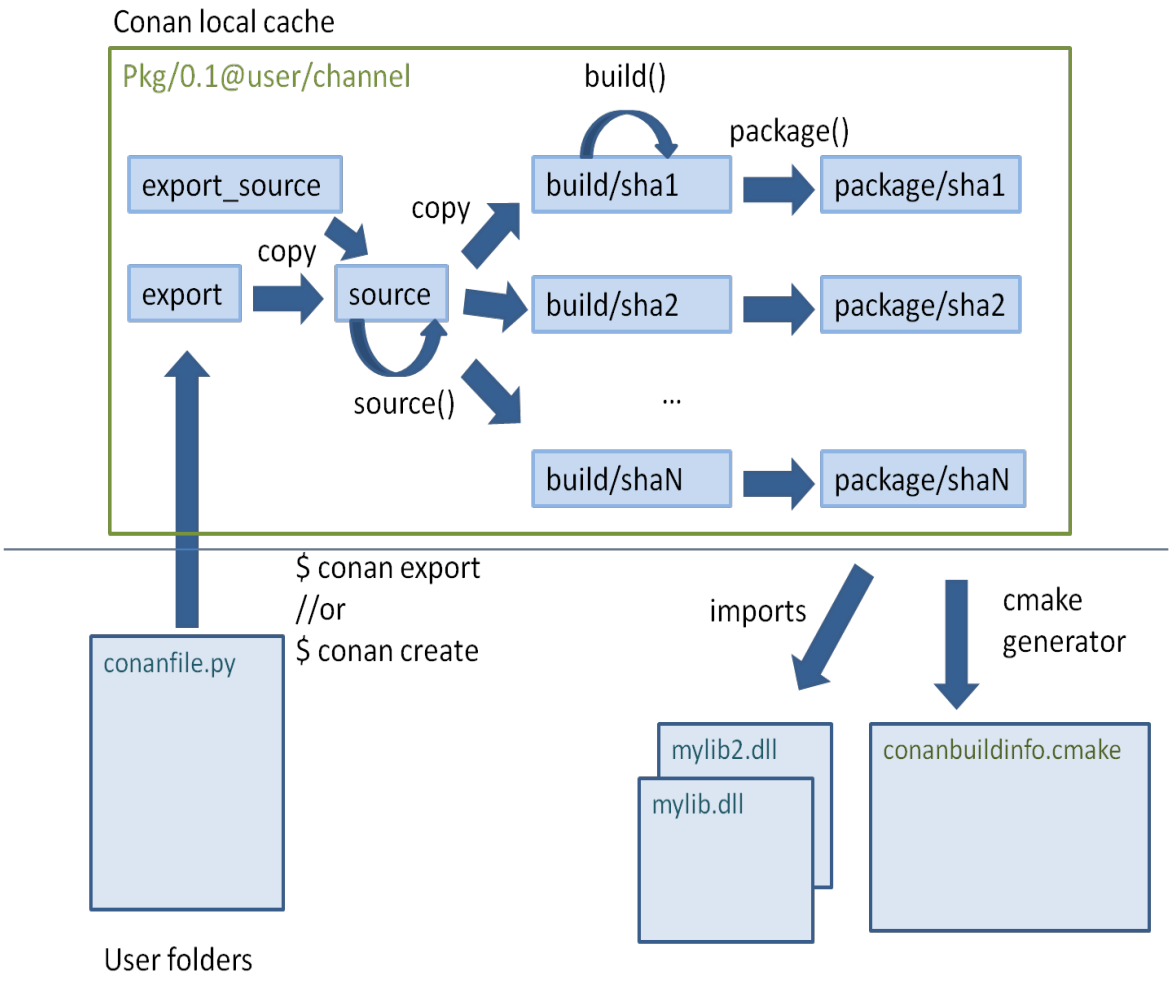
### 5.5.2 Package Creation Process

It is very useful for package creators and Conan users in general to understand the flow for creating a package inside the conan local cache, and all about its layout.

Each package recipe contains five important folders in the **local cache**:

- **export**: The folder in which the package recipe is stored.
- **export_source**: The folder in which code copied with the recipe `exports_sources` attribute is stored.
- **source**: The folder in which the source code for building from sources is stored.
- **build**: The folder in which the actual compilation of sources is done. There will typically be one subfolder for each different binary configuration
- **package**: The folder in which the final package artifacts are stored. There will be one subfolder for each different binary configuration

The *source* and *build* folders only exist when the packages have been built from sources.




The process starts when a package is "exported", via the **`conan export`** command or more typically, with the **`conan create`** command. The *conanfile.py* and files specified by the `exports_sources` field are copied from the user space to the **local cache**.

The *export* and *export_source* files are copied to the *source* folder, and then the `source()` method is executed (if it exists). Note that there is only one source folder for all the binary packages. If when generating the code, there is source code that varies for the different configurations, it cannot be generated using the `source()` method, but rather needs to be generated using the `build()` method.

Then, for each different configuration of settings and options, a package ID will be computed in the form of a SHA-1 hash for this configuration. Sources will be copied to the *build/hashXXX* folder, and the `build()` method will be triggered.

After that, the `package()` method will be called to copy artifacts from the *build/hashXXX* folder to the *package/hashXXX* folder.

Finally, the `package_info()` methods of all dependencies will be called and gathered so you can generate files for the consumer build system, as the *conanbuildinfo.cmake* for the `cmake` generator. Also the `imports` feature will copy artifacts from the local cache into user space if specified.

Any doubts? Please check out our *FAQ section* or .

## 5.6 Defining Package ABI Compatibility

Each package recipe can generate *N* binary packages from it, depending on these three items: `settings`, `options` and `requires`.

When any of the *settings* of a package recipe changes, it will reference a different binary:

```
class MyLibConanPackage(ConanFile):
    name = "MyLib"
    version = "1.0"
    settings = "os", "arch", "compiler", "build_type"
```

When this package is installed by a *conanfile.txt*, another package *conanfile.py*, or directly:

```
$ conan install MyLib/1.0@user/channel -s arch=x86_64 -s ...
```

The process is:

1. Conan gets the user input settings and options. Those settings and options can come from the command line, profiles or from the values cached in the latest **`conan install`** execution.
2. Conan retrieves the `MyLib/1.0@user/channel` recipe, reads the `settings` attribute, and assigns the necessary values.
3. With the current package values for `settings` (also `options` and `requires`), it will compute a SHA1 hash that will serve as the binary package ID, e.g., `c6d75a933080ca17eb7f076813e7fb21aaa740f2`.
4. Conan will try to find the `c6d75...` binary package. If it exists, it will be retrieved. If it cannot be found, it will fail and indicate that it can be built from sources using **`conan install --build`**.

If the package is installed again using different settings, for example, on a 32-bit architecture:

```
$ conan install MyLib/1.0@user/channel -s arch=x86 -s ...
```

The process will be repeated with a different generated package ID, because the `arch` setting will have a different value. The same applies to different compilers, compiler versions, build types. When generating multiple binaries - a separate ID is generated for each configuration.

When developers using the package use the same settings as one of those uploaded binaries, the computed package ID will be identical causing the binary to be retrieved and reused without the need of rebuilding it from the sources.

The `options` behavior is very similar. The main difference is that `options` can be more easily defined at the package level and they can be defaulted. Check the *options* reference.

Note this simple scenario of a **header-only** library. The package does not need to be built, and it will not have any ABI issues at all. The recipe for such a package will be to generate a single binary package, no more. This is easily achieved by not declaring `settings` nor `options` in the recipe as follows:

```
class MyLibConanPackage(ConanFile):
    name = "MyLib"
    version = "1.0"
    # no settings defined!
```

No matter the settings are defined by the users, including the compiler or version, the package settings and options will always be the same (left empty) and they will hash to the same binary package ID. That package will typically contain just the header files.

What happens if we have a library that we can be built with GCC 4.8 and will preserve the ABI compatibility with GCC 4.9? (This kind of compatibility is easier to achieve for example for pure C libraries).

Although it could be argued that it is worth rebuilding with 4.9 too -to get fixes and performance improvements-. Let's suppose that we don't want to create 2 different binaries, but just a single built with GCC 4.8 which also needs to be compatible for GCC 4.9 installations.

### 5.6.1 Defining a Custom package_id()

The default `package_id()` uses the `settings` and `options` directly as defined, and assumes the semantic versioning for dependencies is defined in `requires`.

This `package_id()` method can be overridden to control the package ID generation. Within the `package_id()`, we have access to the `self.info` object, which is hashed to compute the binary ID and contains:

- **self.info.settings**: Contains all the declared settings, always as string values. We can access/modify the settings, e.g., `self.info.settings.compiler.version`.
- **self.info.options**: Contains all the declared options, always as string values too, e.g., `self.info.options.shared`.

Initially this `info` object contains the original settings and options, but they can be changed without constraints to any other string value.

For example, if you are sure your package ABI compatibility is fine for GCC versions > 4.5 and < 5.0, you could do the following:

```
from conans import ConanFile, CMake, tools
from conans.model.version import Version

class PkgConan(ConanFile):
    name = "Pkg"
    version = "1.0"
    settings = "compiler", "build_type"

    def package_id(self):
        v = Version(str(self.settings.compiler.version))
        if self.settings.compiler == "gcc" and (v >= "4.5" and v < "5.0"):
            self.info.settings.compiler.version = "GCC version between 4.5 and 5.0"
```

We have set the `self.info.settings.compiler.version` with an arbitrary string, the value of which is not important (could be any string). The only important thing is that it is the same for any GCC version between 4.5 and 5.0. For all those versions, the compiler version will always be hashed to the same ID.

Let's try and check that it works properly when installing the package for GCC 4.5:

```
$ conan export myuser/mychannel
$ conan install Pkg/1.0@myuser/mychannel -s compiler=gcc -s compiler.version=4.5 ...

Requirements
    Pkg/1.0@myuser/mychannel from local
Packages
    Pkg/1.0@myuser/mychannel:mychannel:af044f9619574eceb8e1cca737a64bdad88246ad
...
```

We can see that the computed package ID is `af04...46ad` (not real). What happens if we specify GCC 4.6?

```
$ conan install Pkg/1.0@myuser/mychannel -s compiler=gcc -s compiler.version=4.6 ...

Requirements
    Pkg/1.0@myuser/mychannel from local
```

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```
Packages
    Pkg/1.0@myuser/mychannel:mychannel:af044f9619574eceb8e1cca737a64bdad88246ad
```

The required package has the same result again `af04...46ad`. Now we can try using GCC 4.4 (< 4.5):

```
$ conan install Pkg/1.0@myuser/mychannel -s compiler=gcc -s compiler.version=4.4 ...

Requirements
    Pkg/1.0@myuser/mychannel from local
Packages
    Pkg/1.0@myuser/mychannel:mychannel:7d02dc01581029782b59dcc8c9783a73ab3c22dd
```

The computed package ID is different which means that we need a different binary package for GCC 4.4.

The same way we have adjusted the `self.info.settings`, we could set the `self.info.options` values if needed.

**See also:**

Check *package_id()* to see the available helper methods and change its behavior for things like:

- Recipes packaging **header only** libraries.
- Adjusting **Visual Studio toolsets** compatibility.

### 5.6.2 Dependency Issues

Let's define a simple scenario whereby there are two packages: `MyOtherLib/2.0` and `MyLib/1.0` which depends on `MyOtherLib/2.0`. Let's assume that their recipes and binaries have already been created and uploaded to a Conan remote.

Now, a new release for `MyOtherLib/2.1` is released with an improved recipe and new binaries. The `MyLib/1.0` is modified and is required to be upgraded to `MyOtherLib/2.1`.

---

**Note:** This scenario will be the same in the case that a consuming project of `MyLib/1.0` defines a dependency to `MyOtherLib/2.1`, which takes precedence over the existing project in `MyLib/1.0`.

---

The question is: **Is it necessary to build new MyLib/1.0 binary packages?** or are the existing packages still valid?

The answer: **It depends**.

Let's assume that both packages are compiled as static libraries and that the API exposed by `MyOtherLib` to `MyLib/1.0` through the public headers, has not changed at all. In this case, it is not required to build new binaries for `MyLib/1.0` because the final consumer will link against both `Mylib/1.0` and `MyOtherLib/2.1`.

On the other hand, it could happen that the API exposed by **MyOtherLib** in the public headers has changed, but without affecting the `MyLib/1.0` binary for any reason (like changes consisting on new functions not used by **MyLib**). The same reasoning would apply if **MyOtherLib** was only the header.

But what if a header file of `MyOtherLib` -named *myadd.h*- has changed from `2.0` to `2.1`:

Listing 1: *myadd.h* header file in version 2.0

```
int addition (int a, int b) { return a - b; }
```

Listing 2: *myadd.h* header file in version 2.1

```
int addition (int a, int b) { return a + b; }
```

And the `addition()` function is called from the compiled *.cpp* files of `MyLib/1.0`?

Then, **a new binary for MyLib/1.0 is required to be built for the new dependency version**. Otherwise it will maintain the old, buggy `addition()` version. Even in the case that `MyLib/1.0` doesn't have any change in its code lines neither in the recipe, the resulting binary rebuilding `MyLib` requires *MyOtherLib/2.1*' and the package to be different.

### 5.6.3 Using package_id() for Package Dependencies

The `self.info` object has also a `requires` object. It is a dictionary containing the necessary information for each requirement, all direct and transitive dependencies. For example, `self.info.requires["MyOtherLib"]` is a `RequirementInfo` object.

- Each `RequirementInfo` has the following *read only* reference fields:
  - `full_name`: Full require's name, e.g., **MyOtherLib**
  - `full_version`: Full require's version, e.g., **1.2**
  - `full_user`: Full require's user, e.g., **my_user**
  - `full_channel`: Full require's channel, e.g., **stable**
  - `full_package_id`: Full require's package ID, e.g., **c6d75a...**
- The following fields are used in the `package_id()` evaluation:
  - `name`: By default same value as full_name, e.g., **MyOtherLib**.
  - `version`: By default the major version representation of the `full_version`. E.g., **1.Y** for a **1.2** `full_version` field and **1.Y.Z** for a **1.2.3** `full_version` field.
  - `user`: By default `None` (doesn't affect the package ID).
  - `channel`: By default `None` (doesn't affect the package ID).
  - `package_id`: By default `None` (doesn't affect the package ID).

When defining a package ID for model dependencies, it is necessary to take into account two factors:

- The versioning schema followed by our requirements (semver?, custom?).
- The type of library being built or reused (shared (*.so*, *.dll*, *.dylib*), static).

#### Versioning Schema

By default Conan assumes semver compatibility. For example, if a version changes from minor **2.0** to **2.1**, Conan will assume that the API is compatible (headers not changing), and that it is not necessary to build a new binary for it. This also applies to patches, whereby changing from **2.1.10** to **2.1.11** doesn't require a re-build.

If it is necessary to change the default behavior, the applied versioning schema can be customized within the `package_id()` method:

```
from conans import ConanFile, CMake, tools
from conans.model.version import Version

class PkgConan(ConanFile):
    name = "Mylib"
    version = "1.0"
    settings = "os", "compiler", "build_type", "arch"
    requires = "MyOtherLib/2.0@lasote/stable"

    def package_id(self):
        myotherlib = self.info.requires["MyOtherLib"]

        # Any change in the MyOtherLib version will change current Package ID
        myotherlib.version = myotherlib.full_version

        # Changes in major and minor versions will change the Package ID but
        # only a MyOtherLib patch won't. E.g., from 1.2.3 to 1.2.89 won't change.
        myotherlib.version = myotherlib.full_version.minor()
```

Besides `version`, there are additional helpers that can be used to determine whether the **channel** and **user** of one dependency also affects the binary package, or even the required package ID can change your own package ID.

You can determine if the following variables within any requirement change the ID of your binary package using the following modes:

| **Modes / Variables** | `name` | `version` | `user` | `channel` | `package_id` |
|---|---|---|---|---|---|
| `semver_mode()` | Yes | Yes, only > 1.0.0 (e.g., **1**.2.Z+b102) | No | No | No |
| `major_mode()` | Yes | Yes (e.g., **1**.2.Z+b102) | No | No | No |
| `minor_mode()` | Yes | Yes (e.g., **1.2**.Z+b102) | No | No | No |
| `patch_mode()` | Yes | Yes (e.g., **1.2.3**+b102) | No | No | No |
| `base_mode()` | Yes | Yes (e.g., **1.7**+b102) | No | No | No |
| `full_version_mode()` | Yes | Yes (e.g., **1.2.3+b102**) | No | No | No |
| `full_recipe_mode()` | Yes | Yes (e.g., **1.2.3+b102**) | Yes | Yes | No |
| `full_package_mode()` | Yes | Yes (e.g., **1.2.3+b102**) | Yes | Yes | Yes |
| `unrelated_mode()` | No | No | No | No | No |

- `semver_mode()`: This is the default mode. In this mode, only a major release version (starting from **1.0.0**) changes the package ID. Every version change prior to 1.0.0 changes the package ID, but only major changes after 1.0.0 will be applied.

```
def package_id(self):
    self.info.requires["MyOtherLib"].semver_mode()
```

- `major_mode()`: Any change in the major release version (starting from **0.0.0**) changes the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].major_mode()
```

- `minor_mode()`: Any change in major or minor (not patch nor build) version of the required dependency changes the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].patch_mode()
```

- `patch_mode()`: Any changes to major, minor or patch (not build) versions of the required dependency change

the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].patch_mode()
```

- `base_mode()`: Any changes to the base of the version (not build) of the required dependency changes the package ID. Note that in the case of semver notation this may produce the same result as `patch_mode()`, but it is actually intended to dismiss the build part of the version even without strict semver.

```
def package_id(self):
    self.info.requires["MyOtherLib"].base_mode()
```

- `full_version_mode()`: Any changes to the version of the required dependency changes the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].full_version_mode()
```

- `full_recipe_mode()`: Any change in the reference of the requirement (user & channel too) changes the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].full_recipe_mode()
```

- `full_package_mode()`: Any change in the required version, user, channel or package ID changes the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].full_package_mode()
```

- `unrelated_mode()`: Requirements do not change the package ID.

```
def package_id(self):
    self.info.requires["MyOtherLib"].unrelated_mode()
```

You can also adjust the individual properties manually:

```
def package_id(self):
    myotherlib = self.info.requires["MyOtherLib"]

    # Same as myotherlib.semver_mode()
    myotherlib.name = myotherlib.full_name
    myotherlib.version = myotherlib.full_version.stable()  # major(), minor(),␣
↪patch(), base, build
    myotherlib.user = myotherlib.channel = myotherlib.package_id = None

    # Only the channel (and the name) matters
    myotherlib.name = myotherlib.full_name
    myotherlib.user = myotherlib.package_id = myotherlib.version = None
    myotherlib.channel = myotherlib.full_channel
```

The result of the `package_id()` is the package ID hash, but the details can be checked in the generated *conaninfo.txt* file. The `[requires]`, `[options]` and `[settings]` are taken into account when generating the SHA1 hash for the package ID, while the `[full_xxxx]` fields show the complete reference information.

The default behavior produces a *conaninfo.txt* that looks like:

```
[requires]
  MyOtherLib/2.Y.Z

[full_requires]
  MyOtherLib/2.2@demo/testing:73bce3fd7eb82b2eabc19fe11317d37da81afa56
```

### Library Types: Shared, Static, Header-only

Let's see some examples, corresponding to common scenarios:

- `MyLib/1.0` is a shared library that links with a static library `MyOtherLib/2.0` package. When a new `MyOtherLib/2.1` version is released: Do I need to create a new binary for `MyLib/1.0` to link with it?

  Yes, always, as the implementation is embedded in the `MyLib/1.0` shared library. If we always want to rebuild our library, even if the channel changes (we assume a channel change could mean a source code change):

  ```
  def package_id(self):
      # Any change in the MyOtherLib version, user or
      # channel or Package ID will affect our package ID
      self.info.requires["MyOtherLib"].full_package_mode()
  ```

- `MyLib/1.0` is a shared library, requiring another shared library `MyOtherLib/2.0` package. When a new `MyOtherLib/2.1` version is released: Do I need to create a new binary for `MyLib/1.0` to link with it?

  It depends. If the public headers have not changed at all, it is not necessary. Actually it might be necessary to consider transitive dependencies that are shared among the public headers, how they are linked and if they cross the frontiers of the API, it might also lead to incompatibilities. If the public headers have changed, it would depend on what changes and how are they used in `MyLib/1.0`. Adding new methods to the public headers will have no impact, but changing the implementation of some functions that will be inlined when compiled from `MyLib/1.0` will definitely require re-building. For this case, it could make sense to have this configuration:

  ```
  def package_id(self):
      # Any change in the MyOtherLib version, user or channel
      # or Package ID will affect our package ID
      self.info.requires["MyOtherLib"].full_package_mode()

      # Or any change in the MyOtherLib version, user or
      # channel will affect our package ID
      self.info.requires["MyOtherLib"].full_recipe_mode()
  ```

- `MyLib/1.0` is a header-only library, linking with any kind (header, static, shared) of library in `MyOtherLib/2.0` package. When a new `MyOtherLib/2.1` version is released: Do I need to create a new binary for `MyLib/1.0` to link with it?

  Never. The package should always be the same as there are no settings, no options, and in any way a dependency can affect a binary, because there is no such binary. The default behavior should be changed to:

  ```
  def package_id(self):
      self.info.requires.clear()
  ```

- `MyLib/1.0` is a static library linking to a header only library in `MyOtherLib/2.0` package. When a new `MyOtherLib/2.1` version is released: Do I need to create a new binary for `MyLib/1.0` to link with it? It could happen that the `MyOtherLib` headers are strictly used in some `MyLib` headers, which are not compiled, but transitively included. But in general, it is more likely that `MyOtherLib` headers are used in `MyLib` implementation files, so every change in them should imply a new binary to be built. If we know that changes in the channel never imply a source code change, as set in our workflow/lifecycle, we could write:

```
def package_id(self):
    self.info.requires["MyOtherLib"].full_package()
    self.info.requires["MyOtherLib"].channel = None # Channel doesn't change out␣
↪package ID
```

## 5.7 Inspecting Packages

You can inspect the uploaded packages and also the packages in the local cache by running the **conan get** command.

- List the files of a local recipe folder:

```
$ conan get zlib/1.2.8@conan/stable .

Listing directory '.':
 CMakeLists.txt
 conanfile.py
 conanmanifest.txt
```

- Print the *conaninfo.txt* file of a binary package:

```
$ conan get zlib/1.2.11@conan/stable -p 09512ff863f37e98ed748eadd9c6df3e4ea424a8
```

- Print the *conanfile.py* from a remote package:

```
$ conan get zlib/1.2.8@conan/stable -r conan-center
```

```
from conans import ConanFile, tools, CMake, AutoToolsBuildEnvironment
from conans.util import files
from conans import __version__ as conan_version
import os


class ZlibConan(ConanFile):
    name = "zlib"
    version = "1.2.8"
    ZIP_FOLDER_NAME = "zlib-%s" % version

    #...
```

Check the *conan get command* command reference and more examples.

## 5.8 Packaging Approaches

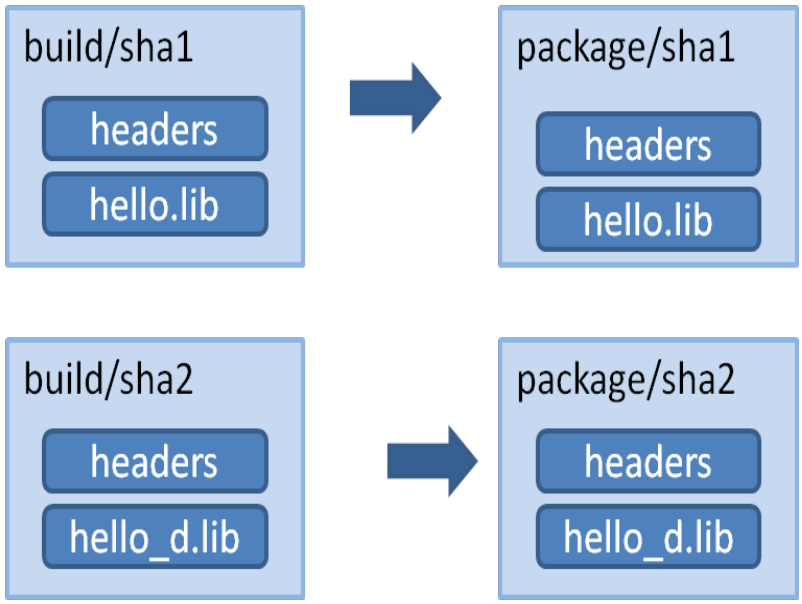
Package recipes have three methods for controlling the package's binary compatibility and for implementing different packaging approaches: *package_id()*, *build_id()* and *package_info()*.

These methods let package creators select the method most suitable for each library.

### 5.8.1 1 config (1 build) -> 1 package

A typical approach is to have one configuration for each package containing the artifacts. Using this approach, for example, the debug pre-compiled libraries will be in a different package than the release pre-compiled libraries.

So if there is a package recipe that builds a "hello" library, there will be one package containing the release version of the "hello.lib" library and a different package containing a debug version of that library (in the figure denoted as "hello_d.lib", to make it clear, it is not necessary to use different names).




Using this approach, the `package_info()` method, allows you to set the appropriate values for consumers, letting them know about the package library names, necessary definitions and compile flags.

```
class HelloConan(ConanFile):

    settings = "os", "compiler", "build_type", "arch"

    def package_info(self):
        self.cpp_info.libs = ["mylib"]
```

It is very important to note that it is declaring the `build_type` as a setting. This means that a different package will be generated for each different value of such setting.

The values declared by the packages (the *include*, *lib* and *bin* subfolders are already defined by default, so they define the include and library path to the package) are translated to variables of the respective build system by the used generators. That is, running the `cmake` generator will translate the above definition in the *conanbuildinfo.cmake* to something like:

```
set(CONAN_LIBS_MYPKG mylib)
# ...
set(CONAN_LIBS mylib ${CONAN_LIBS})
```

Those variables, will be used in the `conan_basic_setup()` macro to actually set the relevant cmake variables.

If the developer wants to switch configuration of the dependencies, he will usually switch with:

```
$ conan install -s build_type=Release ...
# when need to debug
$ conan install -s build_type=Debug ...
```

These switches will be fast, since all the dependencies are already cached locally.

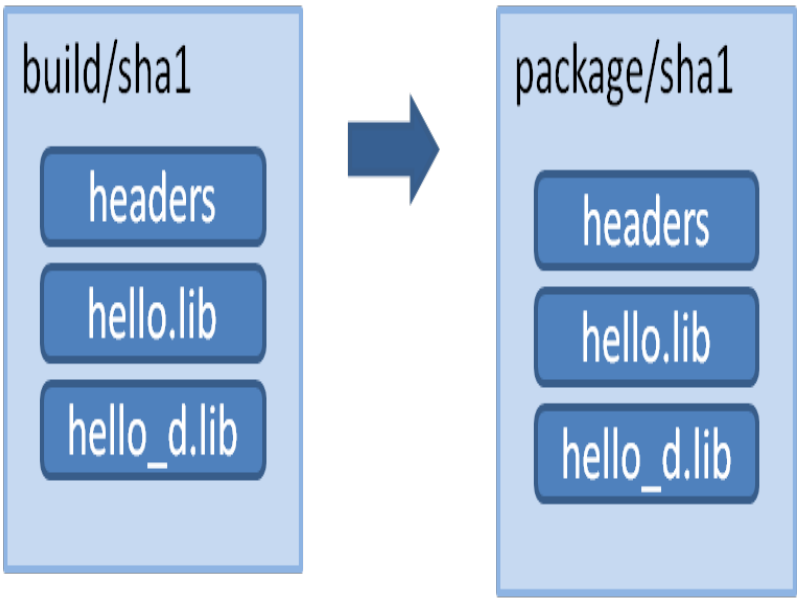
This process offers a number of advantages: - It is quite easy to implement and maintain. - The packages are of minimal size, so disk space and transfers are faster, and builds from sources are also kept to the necessary minimum.

- The decoupling of configurations might help with isolating issues related to mixing different types of artifacts, and also protecting valuable information from deploy and distribution mistakes. For example, debug artifacts might contain symbols or source code, which could help or directly provide means for reverse engineering. So distributing debug artifacts by mistake could be a very risky issue.

Read more about this in *package_info()*.

### 5.8.2 N configs -> 1 package

You may want to package both debug and release artifacts in the same package, so it can be consumed from IDEs like Visual Studio. This will change the debug/release configuration from the IDE, without having to specify it in the command line. This type of package can contain different artifacts for different configurations, and can be used for example to include both the release and debug version of the "hello" library, in the same package.




**Note:** A complete working example of the following code can be found in a github repo. You should be able to run:

```
$ git clone https://github.com/memsharded/hello_multi_config
$ cd hello_multi_config
$ conan create . user/channel -s build_type=Release
$ conan create . user/channel -s build_type=Debug --build=missing
```

Creating a multi-configuration Debug/Release package is simple, see the following example using CMake.

The first step will be to remove `build_type` from the settings. It will not be an input setting, the generated package will always be the same, containing both Debug and Release artifacts. The Visual Studio runtime is different for debug and release (`MDd` or `MD`) and is set using the default runtime (MD/MDd). If this meets your needs, we recommend removing the `runtime` subsetting in the `configure()` method:

```
class Pkg(ConanFile):
    # build_type has been ommitted. It is not an input setting.
    settings = "os", "compiler", "arch"

    def configure(self):
```

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```
        # it is also necessary to remove the VS runtime
        if self.settings.compiler == "Visual Studio":
            del self.settings.compiler.runtime

    def build(self):
        cmake = CMake(self)
        if cmake.is_multi_configuration:
            cmmd = 'cmake "%s" %s' % (self.source_folder, cmake.command_line)
            self.run(cmmd)
            self.run("cmake --build . --config Debug")
            self.run("cmake --build . --config Release")
        else:
            for config in ("Debug", "Release"):
                self.output.info("Building %s" % config)
                self.run('cmake "%s" %s -DCMAKE_BUILD_TYPE=%s'
                         % (self.source_folder, cmake.command_line, config))
                self.run("cmake --build .")
                shutil.rmtree("CMakeFiles")
                os.remove("CMakeCache.txt")
```

In this case, we assume that the binaries will be differentiated with a suffix in the Cmake syntax:

```
set_target_properties(mylibrary PROPERTIES DEBUG_POSTFIX _d)
```

Such a package can define its information for consumers as:

```
def package_info(self):
    self.cpp_info.release.libs = ["mylibrary"]
    self.cpp_info.debug.libs = ["mylibrary_d"]
```

This will translate to the cmake variables:

```
set(CONAN_LIBS_MYPKG_DEBUG mylibrary_d)
set(CONAN_LIBS_MYPKG_RELEASE mylibrary)
# ...
set(CONAN_LIBS_DEBUG mylibrary_d ${CONAN_LIBS_DEBUG})
set(CONAN_LIBS_RELEASE mylibrary ${CONAN_LIBS_RELEASE})
```

And these variables will be correctly applied to each configuration by `conan_basic_setup()` helper.

In this case you can still use the general and not config-specific variables. For example, the include directory when set by default to *include* remains the same for both debug and release. Those general variables will be applied to all configurations.

---

**Important:** The above code assumes that the package will always use the default Visual Studio runtime (MD/MDd). To keep the package configurable for supporting static(MT)/dynamic(MD) linking with the VS runtime library, do the following:

- Keep the `compiler.runtime` setting, i.e. do not implement the `configure()` method removing it.
- Don't let the CMake helper define the `CONAN_LINK_RUNTIME` env-var to define the runtime, because defining it by the consumer will cause it to be incorrectly applied to both the Debug and Release artifacts. This can be done with a `cmake.command_line.replace("CONAN_LINK_RUNTIME", "CONAN_LINK_RUNTIME_MULTI")` to define a new variable.
- Write a separate `package_id()` methods for MD/MDd and for MT/MTd defining the packages to be built.

- In *CMakeLists.txt*, use the `CONAN_LINK_RUNTIME_MULTI` variable to correctly setup up the runtime for debug and release flags.

All these steps are already coded in the repo https://github.com/memsharded/hello_multi_config and commented out as **"Alternative 2"**

Also, you can use any custom configuration as they are not restricted. For example, if your package is a multi-library package, you could try doing something like:

```
def package_info(self):
    self.cpp_info.regex.libs = ["myregexlib1", "myregexlib2"]
    self.cpp_info.filesystem.libs = ["myfilesystemlib"]
```

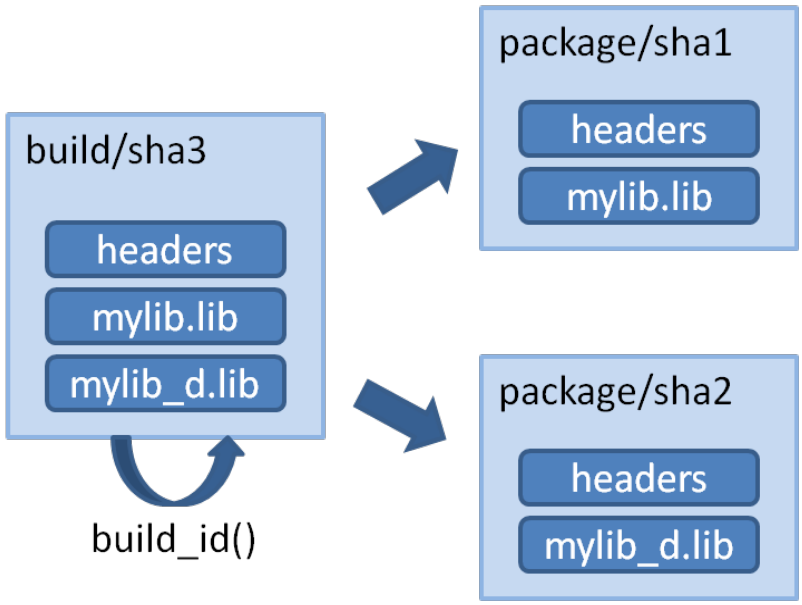
These specific config variables will not be automatically applied, but you can directly use them in your consumer CMake build script.

**Note:** The automatic conversion of multi-config variables to generators is currently only implemented in the `cmake` and `txt` generators. If you want to have support for them in another build system, please open a GitHub issue.

### 5.8.3 N configs (1 build) -> N packages

It's possible that an existing build script is simultaneously building binaries for different configurations, like debug/release, or different architectures (32/64bits), or library types (shared/static). If such a build script is used in the previous "Single configuration packages" approach, it will definitely work without problems. However, we'll be wasting precious build time, as we'll be re-building the rebuilding project for each package, then extracting the relevant artifacts for the relevant configuration, while ignoring the others.

It is more efficient to build the logic, whereby the same build can be reused to create different packages:




This can be done by defining a `build_id()` method in the package recipe that will specify the logic.

```
settings = "os", "compiler", "arch", "build_type"
```

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```
def build_id(self):
    self.info_build.settings.build_type = "Any"

def package(self):
    if self.settings.build_type == "Debug":
        #package debug artifacts
    else:
        # package release
```

Note that the `build_id()` method uses the `self.info_build` object to alter the build hash. If the method doesn't change it, the hash will match the package folder one. By setting `build_type="Any"`, we are forcing that for both the Debug and Release values of `build_type`, the hash will be the same (the particular string is mostly irrelevant, as long as it is the same for both configurations). Note that the build hash `sha3` will be different of both `sha1` and `sha2` package identifiers.

This does not imply that there will be strictly one build folder. There will be a build folder for every configuration (architecture, compiler version, etc). So if we just have Debug/Release build types, and we're producing N packages for N different configurations, we'll have N/2 build folders, saving half of the build time.

Read more about this in *build_id()*.

## 5.9 Package Creator Tools

Using Python (or just pure shell or bash) scripting, allows you to easily automate the whole package creation and testing process, for many different configurations. For example you could put the following script in the package root folder. Name it *build.py*:

```
import os, sys
import platform

def system(command):
    retcode = os.system(command)
    if retcode != 0:
        raise Exception("Error while executing:\n\t %s" % command)

if __name__ == "__main__":
    params = " ".join(sys.argv[1:])

    if platform.system() == "Windows":
        system('conan create . demo/testing -s compiler="Visual Studio" -s compiler.
↪version=14 %s' % params)
        system('conan create . demo/testing -s compiler="Visual Studio" -s compiler.
↪version=12 %s' % params)
        system('conan create . demo/testing -s compiler="gcc" -s compiler.version=4.8
↪%s' % params)
    else:
        pass
```

This is a pure Python script, not related to Conan, and should be run as such:

```
$ python build.py
```

We have developed another FOSS tool for package creators, the **Conan Package Tools** to help you generate multiple binary packages from a package recipe. It offers a simple way to define the different configurations and to call **conan**

**test**. In addition to offering CI integration like **Travis CI, Appveyor and Bamboo**, for cloud-based automated binary package creation, testing, and uploading.

This tool enables the creation of hundreds of binary packages in the cloud with a simple `$ git push` and supports:

- Easy **generation of multiple Conan packages** with different configurations.
- Automated/remote package generation in **Travis/Appveyor** server with distributed builds in CI jobs for big/slow builds.
- **Docker**: Automatic generation of packages for several versions of `gcc` and `clang` in Linux, and in Travis CI.
- Automatic creation of OSX packages with apple-clang, and in Travis-CI.
- **Visual Studio**: Automatic configuration of the command line environment with detected settings.

It's available in pypi:

```
$ pip install conan_package_tools
```

For more information, read the README.md in the Conan Package Tools repository.

CHAPTER

SIX

# UPLOADING PACKAGES

This section shows how to upload packages using remotes and specifies the different binary repositories you can use.

## 6.1 Remotes

In the previous sections, we built several packages on our computer that were stored in the local cache, typically under *~/.conan/data*. Now, you might want to upload them to a Conan server for later use on another machine, project, or for sharing purposes.

Conan packages can be uploaded to different remotes previously configured with a name and a URL. The remotes are just servers used as binary repositories that store packages by reference.

There are several possibilities when uploading packages to a server:

For private development:

- **Artifactory Community Edition for C/C++**: Artifactory Community Edition (CE) for C/C++ is a completely free Artifactory server that implements both Conan and generic repositories. It is the recommended server for companies and teams wanting to host their own private repository. It has a web UI, advanced authentication and permissions, very good performance and scalability, a REST API, and can host generic artifacts (tarballs, zips, etc). Check *Artifactory Community Edition for C/C++* for more information.
- **Artifactory Pro**: Artifactory is the binary repository manager for all major packaging formats. It is the recommended remote type for enterprise and professional package management. Check the Artifactory documentation for more information. For a comparison between Artifactory editions, check the Artifactory Comparison Matrix.
- **Conan server**: Simple, free and open source, MIT licensed server that comes bundled with the Conan client. Check *Running conan_server* for more information.

For distribution:

- **Bintray**: Bintray is a cloud platform that gives you full control over how you publish, store, promote, and distribute software. You can create binary repositories in Bintray to share Conan packages or even create an organization. It is free for open source packages, and the recommended server to distribute to the C and C++ communities. Check *Using Bintray* for more information.

### 6.1.1 Bintray Official Repositories

Conan official repositories for open source libraries are hosted in Bintray. These repositories are maintained by the Conan team. Currently there are two central repositories:

#### Conan Center

**conan-center**: https://bintray.com/conan/conan-center

> This repository contains moderated, curated and well-maintained packages, and is the place in which you can share your packages with the community. To share your package, upload it to your own (or your organization's) repositories and submit an inclusion request to conan-center. Check *conan-center guide* for more information.

#### Conan Transit

**conan-transit**: https://bintray.com/conan/conan-transit (DEPRECATED)

> Deprecated. Contains mostly outdated packages some of which are not compatible with the latest Conan versions, so refrain from using them. This repository only exists for backward compatibility purposes. It is not a default remote in the Conan client and will be completely removed soon. This repository is an exact duplicate of the old `server.conan.io` repository at **June 11, 2017 08:00 CET**. It's a read-only repository, allowing you to only download hosted packages.

Conan comes with **conan-center** repository configured by default. Just in case you want to manually configure this repository you can always add it like this:

```
$ conan remote add conan-center https://conan.bintray.com
```

### 6.1.2 Bintray Community Repositories

There are a number of popular community repositories that may be of interest for Conan users for retrieving open source packages. A number of these repositories are not affiliated with the Conan team.

#### Bincrafters

**bincrafters** : https://bintray.com/bincrafters/public-conan

> The Bincrafters team builds binary software packages for the OSS community. This repository contains a wide and growing variety of Conan packages from contributors.
>
> Use the following command to add this remote to Conan:

```
$ conan remote add bincrafters https://api.bintray.com/conan/bincrafters/
↪public-conan
```

#### Conan Community

**conan-community** : https://bintray.com/conan-community/conan

> Created by Conan developers, and should be considered an incubator for maturing packages before contacting authors or including them in conan-center. This repository contains work-in-progress packages that may still not work and may not be fully featured.
>
> Use the following command to add this remote to Conan:

```
$ conan remote add conan-community https://api.bintray.com/conan/conan-
↪community/conan
```

**Note:** If you are working in a team, you probably want to use the same remotes everywhere: developer machines, CI. The `conan config install` command can automatically define the remotes in a conan client, as well as other resources as profiles. Have a look at the *conan config install* command.

## 6.2 Uploading Packages to Remotes

First, check if the remote you want to upload to is already in your current remote list:

```
$ conan remote list
```

You can easily add any remote. To run a remote on your machine:

```
$ conan remote add my_local_server http://localhost:9300
```

You can search any remote in the same way you search your computer. Actually, many Conan commands can specify a specific remote.

```
$ conan search -r=my_local_server
```

Now, upload the package recipe and all the packages to your remote. In this example, we are using our `my_local_server` remote, but you could use any other.

```
$ conan upload Hello/0.1@demo/testing --all -r=my_local_server
```

You might be prompted for a username and password. The default Conan server remote has a **demo/demo** account we can use for testing.

The `--all` option will upload the package recipe plus all the binary packages. Omitting the `--all` option will upload the package recipe *only*. For fine-grained control over which binary packages are upload to the server, consider using the `--packages/-p` or `--query/-q` flags. `--packages` allows you to explicitly declare which package gets uploaded to the server by specifying the package ID. `--query` accepts a query parameter, e.g. `arch=armv8 and os=Linux`, and only uploads binary packages which match this query. When using the `--query` flag, ensure that your query string is enclosed in quotes to make the parameter explicit to your shell. For example, `conan upload <package> -q 'arch=x86_64 and os=Linux' ...` is appropriate use of the `--query` flag.

Now try again to read the information from the remote. We refer to it as remote, even if it is running on your local machine, as it could be running on another server in your LAN:

```
$ conan search Hello/0.1@demo/testing -r=my_local_server
```

**Note:** If package upload fails, you can try to upload it again. Conan keeps track of the upload integrity and will only upload missing files.

Now we can check if we can download and use them in a project. For that purpose, we first have to **remove the local copies**, otherwise the remote packages will not be downloaded. Since we have just uploaded them, they are identical to the local ones.

```
$ conan remove Hello*
$ conan search
```

Since we have our test setup from the previous section, we can just use it for our test. Go to your package folder and run the tests again, now saying that we don't want to build the sources again, we just want to check if we can download the binaries and use them:

```
$ conan create . demo/testing --not-export --build=never
```

You will see that the test is built, but the packages are not. The binaries are simply downloaded from your local server. You can check their existence on your local computer again with:

```
$ conan search
```

## 6.3 Using Bintray

In Bintray, you can create and manage as many free, personal Conan repositories as you like. On an OSS account, all packages you upload are public, and anyone can use them by simply adding your repository to their Conan remotes.

To allow collaboration on open source projects, you can also create Organizations in Bintray and add members who will be able to create and edit packages in your organization's repositories.

### 6.3.1 Uploading to Bintray

Conan packages can be uploaded to Bintray under your own users or organizations. To create a repository follow these steps:

1. **Create a Bintray Open Source account**

   Browse to https://bintray.com/signup/oss and submit the form to create your account. Note that you don't have to use the same username that you use for your Conan account.

   > **Warning:** Please **make sure you use the Open Source Software OSS account**. Follow this link: https://bintray.com/signup/oss. Bintray provides free Conan repositories for OSS projects, so there is no need to open a Pro or Enterprise Trial account.

2. **Create a Conan repository**

   If you intend to collaborate with other users, you first need to create a Bintray organization, and create your repository under the organization's profile rather than under your own user profile.

   In your user profile (or organization profile), click "Add new repository" and fill in the Create Repository form. Make sure to select Conan as the Type.

3. **Add your Bintray repository**

   Add a Conan remote in your Conan client pointing to your Bintray repository

   ```
   $ conan remote add <REMOTE> <YOUR_BINTRAY_REPO_URL>
   ```

   Use the Set Me Up button on your repository page on Bintray to get its URL.

4. **Get your API key**

   Your API key is the "password" used to authenticate the Conan client to Bintray, NOT your Bintray password. To get your API key, go to "Edit Your Profile" in your Bintray account and check the API Key section.

5. **Set your user credentials**

   Add your Conan user with the API Key, your remote and your Bintray user name:

   ```
   $ conan user -p <APIKEY> -r <REMOTE> <USERNAME>
   ```

Setting the remotes in this way will cause your Conan client to resolve packages and install them from repositories in the following order of priority:

1. conan-center
2. Your own repository

If you want to have your own repository first, please use the `--insert` command line option when adding it:

```
$ conan remote add <your_remote> <your_url> --insert 0
$ conan remote list
  <your remote>: <your_url> [Verify SSL: True]
  conan-center: https://conan.bintray.com [Verify SSL: True]
```

**Tip:** Check the full reference of *$ conan remote* command.

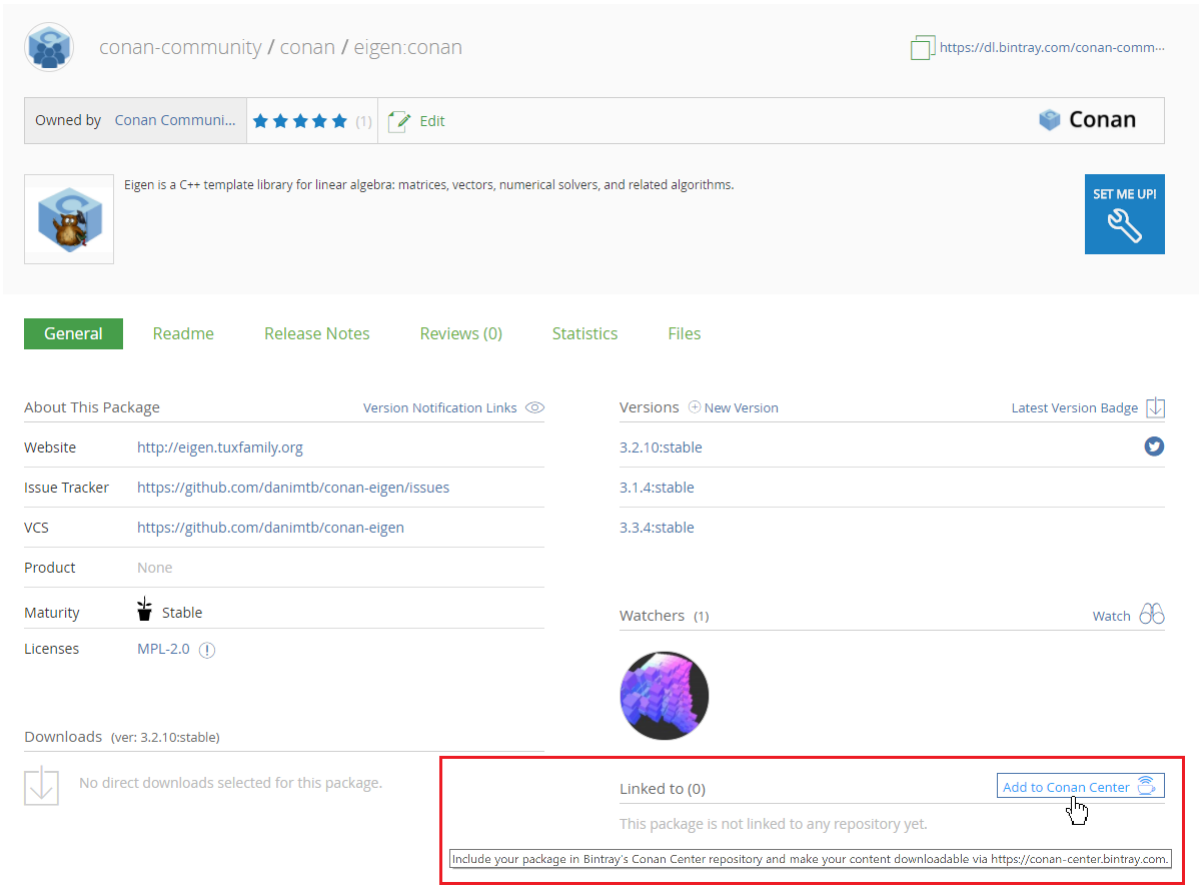
### 6.3.2 Contributing Packages to Conan-Center

The *conan-center* is a moderated and curated repository that is not populated automatically. Initially, it is empty. To have your recipe or binary packages available on conan-center, submit an inclusion request to Bintray and the Bintray team will review your request.

Your request is dealt with differently depending on the submitted package type:

- If you are the **author of an open source library**, your package will be approved. Keep in mind that it is your responsibility to maintain acceptable standards of quality for all packages you submit for inclusion in conan-center.
- If you are packaging a third-party library, follow these guidelines:

Contributing a library to Conan-Center is really straightforward when you know how to *upload your packages to your own Bintray repository*. All you have to do is to navigate to the main page of the package in Bintray and click the **"Add to Conan Center"** button to start the inclusion request process.




### Inclusion Guidelines for Third-Party libraries

During the inclusion request process, the JFrog staff will perform a general review and will make suggestions for improvements or better ways to implement the package.

### A Single Conan Package Per OSS Library

Before creating packages for third-party libraries, please read these general guidelines.

- Ensure that there is no additional Conan package for the same library. If you are planning to support a new version of a library that already exists in the `conan-center` repository, please contact the package author and collaborate. All the versions of the same library have to be on the same Bintray Conan package.
- It is recommended to contact the **library author** and suggest to maintain the Conan package. When possible, open a pull request to the original repository of the library with the required Conan files or suggest to open a new repository with the recipe.
- If you are going to collaborate with different users to maintain the Conan package, open a Bintray organization.

### Recipe Quality

- **Git public repository**: The recipe needs to be hosted in a public Git repository that supports collaboration.
- **Recipe fields**: *description*, *license* and *url* are required. The *license* field refers to the library being packaged.

- **Linter:** Is important to have a reasonably clean Linter, **`conan export`** and **`conan create`** otherwise it will generate warnings and errors. Keep it as clean as possible to guarantee a recipe less prone to error and more coherent.
- **Updated:** Don't use deprecated features and when possible use the latest Conan features, build helpers, etc.
- **Clean:** The code style will be reviewed to guarantee the readability of the recipe.
- **test_package:** The recipes must contain a *test_package*.
- **Maintenance commitment:** You are responsible for keeping the recipe updated, fix issues etc., so be aware that a minimal commitment is required. The Conan organization reserves the right to unlink a poorly maintained package or replace it with better alternatives.
- **Raise errors on invalid configurations:** If the library doesn't work for a specific configuration, e.g., requires **gcc>7**, the recipe must contain a `configure(self)` method that raises an exception in case of invalid settings/options.

```
def configure():
    if self.settings.compiler == "gcc" and self.settings.compiler.version < "7.0":
        raise ConanException("GCC > 7.0 is required")
    if self.settings.os == "Windows":
        raise ConanException("Windows not supported")
```

- **Without version ranges**: Due to the fact that many libraries do not follow semantic versioning, and that dependency resolution of version ranges is not always clear, recipes in the Conan center should fix the version of their dependencies and not use version ranges.
- **LICENSE of the recipe:** The public repository must contain a `LICENSE` file with an OSS license.
- **LICENSE of the library:** Every built binary package must contain one or more `license*` file(s), so make sure that in the `package()` method of your recipe, you include the library licenses in the `licenses` subfolder.

```
def package():
    self.copy("license*", dst="licenses",  ignore_case=True, keep_path=False)
```

Sometimes there is no `license` file, and you will need to extract the license from a header file, as in the following example:

```
def package():
    # Extract the License/s from the header to a file
    tmp = tools.load("header.h")
    license_contents = tmp[2:tmp.find("*/", 1)] # The license begins with a C␣
↪comment /* and ends with */
    tools.save("LICENSE", license_contents)

    # Package it
    self.copy("license*", dst="licenses",  ignore_case=True, keep_path=False)
```

- **Invalid configurations:** There is a special exception, `conans.errors.ConanInvalidConfiguration` to be launched from `configure()` function in a recipe if the given configuration/options is known not to work. This way the recipe owner can declare an invalid configuration and consumers (e.g. CI tools like `conan-package-tools`) will be able to handle it.

### CI Integration

- If you are packaging a header-only library, you will only need to provide one CI configuration (e.g., Travis with gcc 6.1) to validate that the package is built correctly (use **`conan create`**).

- Unless your library is a header-only library or doesn't support a concrete operating system or compiler, you will need to provide a CI systems integration to support:
  - **Linux:** GCC, latest version recommended from each major (4.9, 5.4, 6.3)
  - **Linux:** Clang, latest version recommended from each major (3.9, 4.0)
  - **Mac OSX:** Two latest versions of apple-clang, e.g., (8.0, 8.1) or newer.
  - **Windows:** Visual Studio 12, 14 and 15 (or newer)
- The easiest way to provide the CI integration (with Appveyor for Windows builds, Travis.ci for Linux and OSX, and Gitlab for Linux) is to use the *conan new* command. Take a look at the options to generate a library layout with the required appveyor/travis/gitlab.

  You can also copy the following files from this zlib Conan package repository and modify them:
  - `.travis` folder. No need to adjust anything.
  - `.travis.yml` file. Adjust your username, library reference, etc.
  - `appveyor.yml` file. Adjust your username, library reference, etc.
- Take a look at the *Travis CI*, *Appveyor* and *GitLab CI* integration guides.

### Bintray Package Data

In the Bintray page of your package, fill in the following fields:

- Description (description of the packaged library)
- Licenses (license of the packaged library)
- Tags
- Maturity
- Website: If any, website of the library
- Issues tracker: URL of the issue tracker from your github repository e.g., https://github.com/conan-community/conan-zlib/issues
- Version control: URL of your recipe github repository, e.g., https://github.com/conan-community/conan-zlib
- GitHub repo (user/repo): e.g., conan-community/conan-zlib

For each version page (optional, but recommended):

- Select the README from github.
- Select the Release Notes.

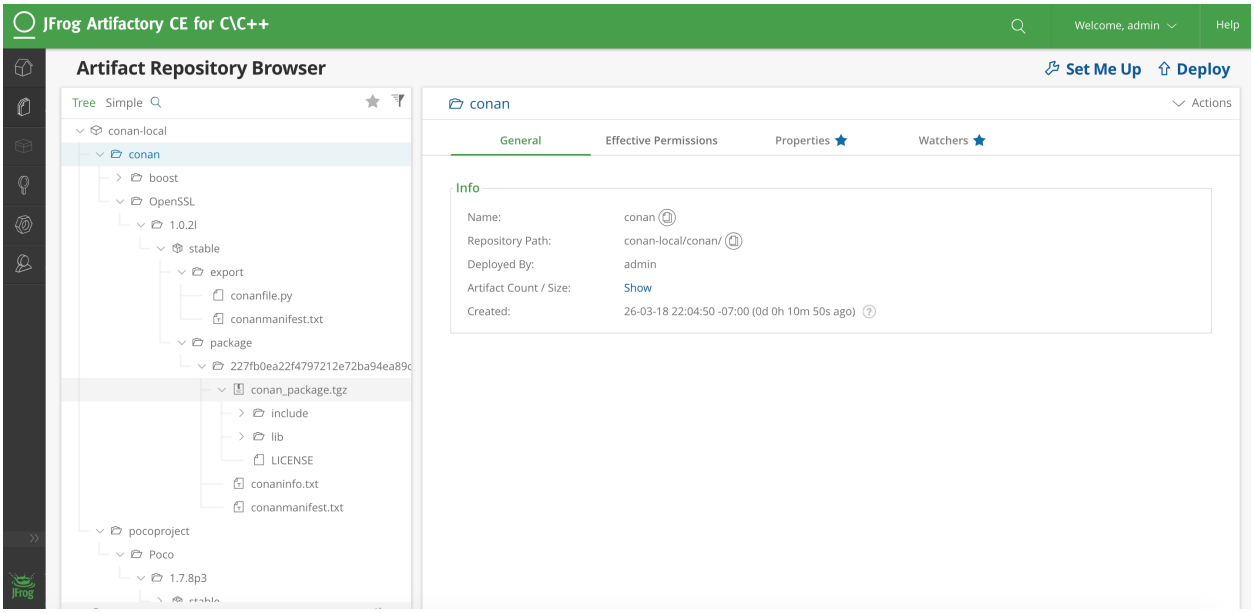
## 6.4 Artifactory Community Edition for C/C++

Artifactory Community Edition (CE) for C/C++ is the recommended server for development and hosting private packages for a team or company. It is completely free, and it features a WebUI, advanced authentication and permissions, great performance and scalability, a REST API, a generic CLI tool and generic repositories to host any kind of source or binary artifact.

This is a very brief introduction to Artifactory CE. For the complete Artifactory CE documentation, visit Artifactory docs.

### 6.4.1 Running Artifactory CE

There are several ways to download and run Artifactory CE. The simplest one might be to download and unzip the designated zip file, though other installers, including also installing from a Docker image. When the file is unzipped, launch Artifactory by double clicking the .bat or .sh script in the *bin* subfolder, depending on the OS. Java 8 update 45 or later runtime is required. If you don't have it, please install it first (newer Java versions preferred).




Once Artifactory has started, navigate to the default URL *http://localhost:8081*, where the Web UI should be running. The default user and password are `admin:password`.

### 6.4.2 Creating and Using a Conan Repo

Navigate to Admin -> Repositories -> Local, then click on the "New" button. A dialog for selecting the package type will appear, select Conan, then type a "Repository Key" (the name of the repository you are about to create), for example "conan-local". You can create multiple repositories to serve different flows, teams, or projects.

Now, it is necessary to configure the client. Go to Artifacts, and click on the created repository. The "Set Me Up" button in the top right corner provides instructions on how to configure the remote in the Conan client:

```
$ conan remote add artifactory http://localhost:8081/artifactory/api/conan/conan-local
```

From now, you can upload, download, search, etc. the remote repos similarly to the other repo types.

```
$ conan upload * --all -r=artifactory
$ conan search * -r=artifactory
```

### 6.4.3 Migrating from Other Servers

If you are already running another server, for example, the open source *conan_server*, it is easy to migrate your packages, using the Conan client to download the packages and re-upload them to the new server.

This Python script might be helpful, given that it already defines the respective `local` and `artifactory` remotes:

```
import os
import subprocess

def run(cmd):
ret = os.system(cmd)
if ret != 0:
    raise Exception("Command failed: %s" % cmd)

# Assuming local = conan_server and artifactory remotes
output = subprocess.check_output("conan search -r=local --raw")
packages = output.splitlines()

for package in packages:
print("Downloading %s" % package)
run("conan download %s -r=local" % package)

run("conan upload * --all --confirm -r=artifactory")
```

## 6.5 Running conan_server

The *conan_server* is a free and open source server that implements Conan remote repositories. It is a very simple application, bundled with the regular Conan client installation. In most cases, it is recommended to use the free Artifactory Community Edition for C/C++ server, check *Artifactory Community Edition for C/C++* for more information.

Running the simple open source *conan_server* that comes with the Conan installers (or pip packages) is simple. Just open a terminal and type:

```
$ conan_server
```

**Note:** On Windows, you may experience problems with the server if you run it under bash/msys. It is better to launch it in a regular `cmd` window.

This server is mainly used for testing (though it might work fine for small teams). If you need a more stable, responsive and robust server, you should run it from source:

### 6.5.1 Running from Source (linux)

The Conan installer includes a simple executable **conan_server** for a server quick start. But you can use the **conan server** through the WSGI application, which means that you can use gunicorn to run the app, for example.

First, clone the Conan repository from source and install the requirements:

```
$ git clone https://github.com/conan-io/conan.git
$ cd conan
$ git checkout master
$ pip install -r conans/requirements.txt
$ pip install -r conans/requirements_server.txt
$ pip install gunicorn
```

Run the server application with `gunicorn`. In the following example, we run the server on port 9300 with four workers and a timeout of 5 minutes (300 seconds, for large uploads/downloads, you can also decrease it if you don't have very large binaries):

```
$ gunicorn -b 0.0.0.0:9300 -w 4 -t 300 conans.server.server_launcher:app
```

**Note:** Please note the timeout of `-t 300` seconds, resulting in a 5 minute parameter. If your transfers are very large or on a slow network, you might need to increase that value.

You can also bind to an IPv6 address or specify both IPv4 and IPv6 addresses:

```
$ gunicorn -b 0.0.0.0:9300 -b [::1]:9300 -w 4 -t 300 conans.server.server_launcher:app
```

### 6.5.2 Server Configuration

Your server configuration is saved under `~/.conan_server/server.conf`. You can change values there, prior to launching the server. Note that the server is not reloaded when the values are changed. You have to stop and restart it manually.

The server configuration file is by default:

```
[server]
jwt_secret: MnpuzsExftskYGOMgaTYDKfw
jwt_expire_minutes: 120

ssl_enabled: False
port: 9300
public_port:
host_name: localhost

store_adapter: disk
authorize_timeout: 1800

# Just for disk storage adapter
disk_storage_path: ~/.conan_server/data
disk_authorize_timeout: 1800

updown_secret: NyiSWNWnwumTVpGpoANuyyhR


[write_permissions]
# "opencv/2.3.4@lasote/testing": default_user,default_user2

[read_permissions]
# opencv/1.2.3@lasote/testing: default_user default_user2
# By default all users can read all blocks
*/*@*/*: *

[users]
demo: demo
```

#### Server Parameters

- `port`: Port where **conan_server** will run.
- The client server authorization is done with JWT. `jwt_secret` is a random string used to generate authentication tokens. You can change it safely anytime (in fact it is a good practice). The change will just force users

to log in again. `jwt_expire_minutes` is the amount of time that users remain logged-in within the client without having to introduce their credentials again.

Other parameters (not recommended from Conan 1.1, but necessary for previous versions):

- `host_name`: If you set `host_name`, you must use the machine's IP where you are running your server (or domain name), something like **host_name: 192.168.1.100**. This IP (or domain name) has to be visible (and resolved) by the Conan client, so take it into account if your server has multiple network interfaces.
- `public_port`: Might be needed when running virtualized, Docker or any other kind of port redirection. File uploads/downloads are served with their own URLs, generated by the system, so the file storage backend is independent. Those URLs need the public port they have to communicate from the outside. If you leave it blank, the `port` value is used.

  **Example:** Use conan_server in a Docker container that internally runs in the 9300 port but exposes the 9999 port (where the clients will connect to):

  ```
  docker run ... -p9300:9999 ... # Check Docker docs for that
  ```

  **server.conf**

  ```
  [server]

  ssl_enabled: False
  port: 9300
  public_port: 9999
  host_name: localhost
  ```

- `ssl_enabled` Conan doesn't handle the SSL traffic by itself, but you can use a proxy like Nginx to redirect the SSL traffic to your Conan server. If your Conan clients are connecting with "https", set *ssl_enabled* to True. This way the conan_server will generate the upload/download urls with "https" instead of "http".

---

**Note: Important**: The Conan client, by default, will validate the server SSL certificates and won't connect if it's invalid. If you have self signed certificates you have two options:

1. Use the **`conan remote`** command to disable the SSL certificate checks. E.g., *conan remote add/update myremote https://somedir False*
2. Append the server *.crt* file contents to *~/.conan/cacert.pem* file.

To learn more, see *How to manage SSL (TLS) certificates*.

---

Conan has implemented an extensible storage backend based on the abstract class `StorageAdapter`. Currently, the server only supports storage on `disk`. The folder in which the uploaded packages are stored (i.e., the folder you would want to backup) is defined in the `disk_storage_path`.

The storage backend might use a different channel, and uploads/downloads are authorized up to a maximum of `authorize_timeout` seconds. The value should sufficient so that large downloads/uploads are not rejected, but not too big to prevent hanging up the file transfers. The value `disk_authorize_timeout` is not currently used. File transfers are authorized with their own tokens, generated with the secret `updown_secret`. This value should be different from the above `jwt_secret`.

### Running the Conan Server with SSL using Nginx

**server.conf**

```
[server]
port: 9300
```

**nginx conf file**

```
server {
    listen 443;
    server_name myservername.mydomain.com;

    location / {
      proxy_pass http://0.0.0.0:9300;
    }
    ssl on;
    ssl_certificate /etc/nginx/ssl/server.crt;
    ssl_certificate_key /etc/nginx/ssl/server.key;
}
```

**remote configuration in Conan client**

```
$ conan remote add myremote https://myservername.mydomain.com
```

### Running the Conan Server with SSL using Nginx in a Subdirectory

**server.conf**

```
[server]
port: 9300
```

**nginx conf file**

```
server {

       listen 443;
       ssl on;
       ssl_certificate /usr/local/etc/nginx/ssl/server.crt;
       ssl_certificate_key /usr/local/etc/nginx/ssl/server.key;
       server_name myservername.mydomain.com;

       location /subdir/ {
          proxy_pass http://0.0.0.0:9300/;
       }
  }
```

**remote configuration in Conan client**

```
$ conan remote add myremote https://myservername.mydomain.com/subdir/
```

### Running Conan Server using Apache

You need to install `mod_wsgi`. If you want to use Conan installed from `pip`, the conf file should be similar to the following example:

**Apache conf file** (e.g., /etc/apache2/sites-available/0_conan.conf)

```
<VirtualHost *:80>
    WSGIScriptAlias / /usr/local/lib/python2.7/dist-packages/conans/server/
↪server_launcher.py
    WSGICallableObject app
    WSGIPassAuthorization On

    <Directory /usr/local/lib/python2.7/dist-packages/conans>
        Require all granted
    </Directory>
</VirtualHost>
```

If you want to use Conan checked out from source in, for example in */srv/conan*, the conf file should be as follows:

**Apache conf file** (e.g., /etc/apache2/sites-available/0_conan.conf)

```
<VirtualHost *:80>
    WSGIScriptAlias / /srv/conan/conans/server/server_launcher.py
    WSGICallableObject app
    WSGIPassAuthorization On

    <Directory /srv/conan/conans>
        Require all granted
    </Directory>
</VirtualHost>
```

The directive `WSGIPassAuthorization On` is needed to pass the HTTP basic authentication to Conan.

Also take into account that the server config files are located in the home of the configured Apache user, e.g., var/www/.conan_server, so remember to use that directory to configure your Conan server.

### Permissions Parameters

By default, the server configuration when set to Read can be done anonymous, but uploading requires you to be registered users. Users can easily be registered in the `[users]` section, by defining a pair of `login: password` for each one. Plain text passwords are used at the moment, but as the server is on-premises (behind firewall), you just need to trust your sysadmin :)

If you want to restrict read/write access to specific packages, configure the `[read_permissions]` and `[write_permissions]` sections. These sections specify the sequence of patterns and authorized users, in the form:

```
# use a comma-separated, no-spaces list of users
package/version@user/channel: allowed_user1,allowed_user2
```

E.g.:

```
*/*@*/*: * # allow all users to all packages
PackageA/*@*/*: john,peter # allow john and peter access to any PackageA
*/*@project/*: john # Allow john to access any package from the "project" user
```

The rules are evaluated in order. If the left side of the pattern matches, the rule is applied and it will not continue searching for matches.

### Authentication

By default, Conan provides a simple `user: password` users list in the `server.conf` file.

There is also a plugin mechanism for setting other authentication methods. The process to install any of them is a simple two-step process:

1. Copy the authenticator source file into the `.conan_server/plugins/authenticator` folder.
2. Add `custom_authenticator: authenticator_name` to the `server.conf` [server] section.

This is a list of available authenticators, visit their URLs to retrieve them, but also to report issues and collaborate:

- **htpasswd**: Use your server Apache htpasswd file to authenticate users. Get it: https://github.com/d-schiffner/conan-htpasswd
- **LDAP**: Use your LDAP server to authenticate users. Get it: https://github.com/uilianries/conan-ldap-authentication

### Create Your Own Custom Authenticator

If you want to create your own Authenticator, create a Python module in `~/.conan_server/plugins/authenticator/my_authenticator.py`

**Example:**

```
def get_class():
    return MyAuthenticator()


class MyAuthenticator(object):
    def valid_user(self, username, plain_password):
        return username == "foo" and plain_password == "bar"
```

The module has to implement:

- A factory function `get_class()` that returns a class with a `valid_user()` method instance.
- The class containing the `valid_user()` that has to return True if the user and password are valid or False otherwise.

Got any doubts? Please check out our *FAQ section* or .

CHAPTER

SEVEN

# DEVELOPING PACKAGES

This section describes how to work on packages which source code is being modified.

## 7.1 Package development flow

In the previous examples, we used the **`conan create`** command to create a package of our library. Every time it is run, Conan performs the following costly operations:

1. Copy the sources to a new and clean build folder.
2. Build the entire library from scratch.
3. Package the library once it is built.
4. Build the `test_package` example and test if it works.

But sometimes, especially with big libraries, while we are developing the recipe, **we cannot afford** to perform these operations every time.

The following section describes the local development flow, based on the Bincrafters community blog.

---

The local workflow encourages users to perform trial-and-error in a local sub-directory relative to their recipe, much like how developers typically test building their projects with other build tools. The strategy is to test the *conanfile.py* methods individually during this phase.

We will use this conan flow example to follow the steps in the order below.

### 7.1.1 conan source

You will generally want to start off with the **`conan source`** command. The strategy here is that you're testing your source method in isolation, and downloading the files to a temporary sub-folder relative to the *conanfile.py*. This just makes it easier to get to the sources and validate them.

This method outputs the source files into the source-folder.

| Input folders | Output folders |
|---|---|
| – | `source-folder` |

```
$ cd example_conan_flow
$ conan source . --source-folder=tmp/source

PROJECT: Configuring sources in C:\Users\conan\example_conan_flow\tmp\source
Cloning into 'hello'...
...
```

Once you've got your source method right and it contains the files you expect, you can move on to testing the various attributes and methods related to downloading dependencies.

### 7.1.2 conan install

Conan has multiple methods and attributes which relate to dependencies (all the ones with the word "require" in the name). The command **`conan install`** activates all them.

| Input folders | Output folders |
|---|---|
| – | `install-folder` |

```
$ conan install . --install-folder=tmp/build [--profile XXXX]

PROJECT: Installing C:\Users\conan\example_conan_flow\conanfile.py
Requirements
Packages
...
```

This also generates the *conaninfo.txt* and *conanbuildinfo.xyz* files (extensions depends on the generator you've used) in the temp folder (`install-folder`), which will be needed for the next step. Once you've got this command working with no errors, you can move on to testing the `build()` method.

### 7.1.3 conan build

The build method takes a path to a folder that has sources and also to the install folder to get the information of the settings and dependencies. It uses a path to a folder where it will perform the build. In this case, as we are including the *conanbuildinfo.cmake* file, we will use the folder from the install step.

| Input folders | Output folders |
|---|---|
| `source-folder`<br>`install-folder` | `build-folder` |

```
$ conan build . --source-folder=tmp/source --build-folder=tmp/build

Project: Running build()
...
Build succeeded.
    0 Warning(s)
    0 Error(s)

Time Elapsed 00:00:03.34
```

Here we can avoid the repetition of `--install-folder=tmp/build` and it will be defaulted to the `--build-folder` value.

This is pretty straightforward, but it does add a very helpful new shortcut for people who are packaging their own library. Now, developers can make changes in their normal source directory and just pass that path as the `--source-folder`.

### 7.1.4 conan package

Just as it sounds, this command now simply runs the `package()` method of a recipe. It needs all the information of the other folders in order to collect the needed information for the package: header files from source folder, settings and dependency information from the install folder and built artifacts from the build folder.

| Input folders | Output folders |
|---|---|
| `source-folder`<br>`install-folder`<br>`build-folder` | `package-folder` |

```
$ conan package . --source-folder=tmp/source --build-folder=tmp/build --package-
↪folder=tmp/package

PROJECT: Generating the package
PROJECT: Package folder C:\Users\conan\example_conan_flow\tmp\package
PROJECT: Calling package()
PROJECT package(): Copied 1 '.h' files: hello.h
PROJECT package(): Copied 2 '.lib' files: greet.lib, hello.lib
PROJECT: Package 'package' created
```

### 7.1.5 conan export-pkg

When you have checked that the package is done correctly, you can generate the package in the local cache. Note that the package is generated again to make sure this step is always reproducible.

This parameters takes the same parameters as `package()`.

| Input folders | Output folders |
|---|---|
| `source-folder`<br>`install-folder`<br>`build-folder`<br>`package-folder` | – |

There are 2 modes of operation:

- Using `source-folder` and `build-folder` will use the `package()` method to extract the artifacts from those folders and create the package, directly in the Conan local cache. Strictly speaking, it doesn't require executing a **`conan package`** before, as it packages directly from these source and build folders, though **`conan package`** is still recommended in the dev-flow to debug the `package()` method.
- Using the `package-folder` argument (incompatible with the above 2), will not use the `package()` method, it will create an exact copy of the provided folder. It assumes the package has already been created by a previous **`conan package`** command or with a **`conan build`** command with a `build()` method running a `cmake.install()`.

```
$ conan export-pkg . user/channel --source-folder=tmp/source --build-folder=tmp/build␣
↪--profile=myprofile

Packaging to 6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7
Hello/1.1@user/channel: Generating the package
Hello/1.1@user/channel: Package folder C:\Users\conan\.conan\data\Hello\1.
↪1\user\channel\package\6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7
Hello/1.1@user/channel: Calling package()
Hello/1.1@user/channel package(): Copied 2 '.lib' files: greet.lib, hello.lib
Hello/1.1@user/channel package(): Copied 2 '.lib' files: greet.lib, hello.lib
Hello/1.1@user/channel: Package '6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7' created
```

### 7.1.6 conan test

The final step to test the package for consumers is the test command. This step is quite straight-forward:

```
$ conan test test_package Hello/1.1@user/channel

Hello/1.1@user/channel (test package): Installing C:\Users\conan\repos\example_conan_
↪flow\test_package\conanfile.py
Requirements
    Hello/1.1@user/channel from local
Packages
    Hello/1.1@user/channel:6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7

Hello/1.1@user/channel: Already installed!
Hello/1.1@user/channel (test package): Generator cmake created conanbuildinfo.cmake
Hello/1.1@user/channel (test package): Generator txt created conanbuildinfo.txt
Hello/1.1@user/channel (test package): Generated conaninfo.txt
Hello/1.1@user/channel (test package): Running build()
...
```

There is often a need to repeatedly re-run the test to check the package is well generated for consumers.

As a summary, you could use the default folders and the flow would be as simple as:

```
$ git clone git@github.com:memsharded/example_conan_flow.git
$ cd example_conan_flow
$ conan source .
$ conan install . -pr=default
$ conan build .
$ conan package .
# So far, this is local. Now put the local binaries in cache
$ conan export-pkg . Hello/1.1@user/testing -pr=default
# And test it, to check it is working in the local cache
$ conan test test_package Hello/1.1@user/testing
...
Hello/1.1@user/testing (test package): Running test()
Hello World!
```

### 7.1.7 conan create

Now we know we have all the steps of a recipe working. Thus, now is an appropriate time to try to run the recipe all the way through, and put it completely in the local cache.

The usual command for this is **conan create** and it basically performs the previous commands with **conan test** for the *test_package* folder:

```
$ conan create . user/channel
```

Even with this command, the package creator can iterate over the local cache if something does not work. This could be done with `--keep-source` and `--keep-build` flags.

If you see in the traces that the `source()` method has been properly executed but the package creation finally failed, you can skip the `source()` method the next time issue **conan create** using **--keep-source**:

```
$ conan create . user/channel --keep-source

Hello/1.1@user/channel: A new conanfile.py version was exported
Hello/1.1@user/channel: Folder: C:\Users\conan\.conan\data\Hello\1.
↪1\user\channel\export
Hello/1.1@user/channel (test package): Installing C:\Users\conan\repos\example_conan_
↪flow\test_package\conanfile.py
Requirements
    Hello/1.1@user/channel from local
Packages
    Hello/1.1@user/channel:6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7

Hello/1.1@user/channel: WARN: Forced build from source
Hello/1.1@user/channel: Building your package in C:\Users\conan\.conan\data\Hello\1.
↪1\user\channel\build\6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7
Hello/1.1@user/channel: Configuring sources in C:\Users\conan\.conan\data\Hello\1.
↪1\user\channel\source
Cloning into 'hello'...
remote: Counting objects: 17, done.
remote: Total 17 (delta 0), reused 0 (delta 0), pack-reused 17
Unpacking objects: 100% (17/17), done.
Switched to a new branch 'static_shared'
Branch 'static_shared' set up to track remote branch 'static_shared' from 'origin'.
Hello/1.1@user/channel: Copying sources to build folder
Hello/1.1@user/channel: Generator cmake created conanbuildinfo.cmake
Hello/1.1@user/channel: Calling build()
...
```

If you see that the library is also built correctly, you can also skip the `build()` step with the `--keep-build` flag:

```
$ conan create . user/channel --keep-build
```

## 7.2 Workspaces [EXPERIMENTAL]

**Warning:** This is an **experimental** feature (actually a preview of the feature). File formats, commands and flows are subject to breaking changes in future releases.

Sometimes, it is necessary to work on more than one package simultaneously. In theory, each package should be a distinct "work unit", and developers should be able to work on them in isolation. However, some changes require modifications in more than one package at the same time. The local development flow can help, but it still requires using `export-pkg` to put the artifacts in the local cache, where other packages under development can consume them.

Conan Workspaces allow having more than one package in user folders, and have them directly use other packages from user folders without having to put them in the local cache.

Let's introduce Workspaces with a practical example:

```
$ git clone https://github.com/memsharded/conan-workspace-example.git
$ cd conan-workspace-example
```

Note that this folder contains a *conanws.yml* file in the root, with the following contents:

```
HelloB:
    folder: B
    includedirs: src
    cmakedir: src
HelloC:
    folder: C
    includedirs: src
    cmakedir: src
HelloA:
    folder: A
    cmakedir: src

root: HelloA
generator: cmake
name: MyProject
```

Next, run a **conan install** as usual, using a *build* folder to output the dependencies information:

```
$ conan install . -if=build
Using conanws.yml file from C:\Users\<youruser>\conan-workspace-example
Workspace: Installing...
Requirements
    HelloA/root@project/develop from 'conanws.yml'
    HelloB/0.1@user/testing from 'conanws.yml'
    HelloC/0.1@user/testing from 'conanws.yml'
Packages
    HelloA/root@project/develop:8a1ff0ad9a2a372996a26ff4136faa83268b5442
    HelloB/0.1@user/testing:e5affb0ca4e5d6998c29f435daf78ab20ef50be5
    HelloC/0.1@user/testing:63da998e3642b50bee33f4449826b2d623661505

Workspace HelloC: Generator cmake created conanbuildinfo.cmake
Workspace HelloC: Generated conaninfo.txt
Workspace HelloC: Generated conanbuildinfo.txt
Workspace HelloB: Generator cmake created conanbuildinfo.cmake
Workspace HelloB: Generated conaninfo.txt
Workspace HelloB: Generated conanbuildinfo.txt
Workspace HelloA: Generator cmake created conanbuildinfo.cmake
Workspace HelloA: Generated conaninfo.txt
Workspace HelloA: Generated conanbuildinfo.txt
```

Note that nothing will really be installed in the local cache. All the dependencies are resolved locally:

```
$ conan search
There are no packages
```

Also, all the generated *conanbuildinfo.cmake* files for the dependencies are installed in the *build* folder. You can inspect them to check that the paths they define for their dependencies are user folders. They don't point to the local cache.

As defined in the *conanws.yml*, a root *CMakeLists.txt* is generated for us. We can use it to generate the super-project and build it:

```
$ cd build
$ cmake .. -G "Visual Studio 14 Win64" # Adapt accordingly to your conan profile
# Now build it. You can also open your IDE and build
$ cmake --build . --config Release
$ ./A/Release/app.exe
Hello World C Release!
Hello World B Release!
Hello World A Release!
```

Now the project is editable. You can change the code of folder C *hello.cpp* to say "Bye World" and:

```
# Edit your C/src/hello.cpp file to say "Bye"
# Or press the build button of your IDE
$ cmake --build . --config Release
$ ./A/Release/app.exe
Bye World C Release!
Hello World B Release!
Hello World A Release!
```

### 7.2.1 In-source builds

The current approach with automatic generation of the super-project is only valid if all the opened packages are using the same build system, CMake. However, without using a super-project, you can still use Workspaces to simultaneously work on different packages with different build systems.

For this case, the *conanws.yml* won't have the `generator` or `name` fields. The installation will be done without specifying an install folder:

```
$ conan install .
```

Each local package will have its own build folder, which will contain the generated *conanbuildinfo.cmake* file. You can do local builds in each of the packages, and they will be referring and linking the other opened packages in user folders.

### 7.2.2 conanws.yml syntax

The *conanws.yml* file can be located in any parent folder of the location pointed to by the **`conan install`** command. Conan will search up through the folder hierarchy looking for a *conanws.yml* file. If the file is not found, the normal **`conan install`** command for a single package will be executed.

Any "opened" package will have an entry in the *conanws.yml* file. This entry will define the relative location of different folders:

```
HelloB:
    folder: B
    includedirs: src  # relative to B, i.e. B/src
    cmakedir: src # Where the CMakeLists.txt is, necessary for the super-project
    build: "'build' if '{os}'=='Windows' else 'build_{build_type}'.lower()"
    libdirs: "'build/{build_type}' if '{os}'=='Windows' else 'build_{build_type}'.
↪lower()"
```

If necessary, the local `build` and `libdirs` folders can be parameterized with the build type and the architecture (`arch`) to account for different layouts and configurations.

The `root` field of *conanws.yml* defines the end consumers. They are needed as an input to define the dependency graph. There can be more than one `root` in a comma separated list, but all of them will share the same dependency graph, so if they require different versions of the same dependencies, they will conflict.

```
root: HelloA, Other
generator: cmake # The super-project build system
name: MyProject # Name for the super-project
```

### 7.2.3 Known limitations

So far, only the CMake super-project generator is implemented. A Visual Studio version seems feasible, but is currently still under development and not yet available.

---

**Important:** We really want your feedback. Please submit any suggestions, problems or ideas as issues to https://github.com/conan-io/conan/issues making sure to use the [workspaces] prefix in the issue title.

---

CHAPTER

EIGHT

# PACKAGE APPS AND DEVTOOLS

With conan it is possible to package and deploy applications. It is also possible that these applications are also dev-tools, like compilers (e.g. MinGW), or build systems (e.g. CMake).

This section describes how to package and run executables, and also how to package dev-tools. Also, how to apply applications like dev-tools or even libraries (like testing frameworks) to other packages to build them from sources:`build_requires`

## 8.1 Running and deploying packages

Executables and applications including shared libraries can be also distributed, deployed and run with conan. This might have some advantages compared to deploying with other systems:

- A unified development and distribution tool, for all systems and platforms
- Manage any number of different deployment configurations in the same way you manage them for development
- Use a conan server remote to store all your applications and runtimes for all Operating Systems, platforms and targets

There are different approaches:

### 8.1.1 Using virtual environments

We can create a package that contains an executable, for example from the default package template created by **`conan new`**:

```
$ conan new Hello/0.1
```

The source code used contains an executable called `greet`, but it is not packaged by default. Let's modify the recipe `package()` method to also package the executable:

```
def package(self):
    self.copy("*greet*", src="hello/bin", dst="bin", keep_path=False)
```

Now we create the package as usual, but if we try to run the executable it won't be found:

```
$ conan create . user/testing
...
Hello/0.1@user/testing package(): Copied 1 '.h' files: hello.h
Hello/0.1@user/testing package(): Copied 1 '.exe' files: greet.exe
Hello/0.1@user/testing package(): Copied 1 '.lib' files: hello.lib
```

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```
$ greet
> ... not found...
```

By default, Conan does not modify by default the environment, it will just create the package in the local cache, and that is not in the system PATH, so the `greet` executable is not found.

The `virtualrunenv` generator generates files that add the package's default binary locations to the necessary paths:

- It adds the dependencies `lib` subfolder to the `DYLD_LIBRARY_PATH` environment variable (for OSX shared libraries)
- It adds the dependencies `lib` subfolder to the `LD_LIBRARY_PATH` environment variable (for Linux shared libraries)
- It adds the dependencies `bin` subfolder to the `PATH` environment variable (for executables)

So if we install the package, specifying such `virtualrunenv` like:

```
$ conan install Hello/0.1@user/testing -g virtualrunenv
```

This will generate a few files that can be called to activate and deactivate the required environment variables

```
$ activate_run.sh # $ source activate_run.sh in Unix/Linux
$ greet
> Hello World!
$ deactivate_run.sh # $ source deactivate_run.sh in Unix/Linux
```

### 8.1.2 Imports

It is possible to define a custom conanfile (either .txt or .py), with an `imports` section, that can retrieve from local cache the desired files. This approach, requires a user conanfile. For more details see example below *runtime packages*

### 8.1.3 Deployable packages

With the `deploy()` method, a package can specify which files and artifacts to copy to user space or to other locations in the system. Let's modify the example recipe adding the `deploy()` method:

```
def deploy(self):
    self.copy("*", dst="bin", src="bin")
```

And run **`conan create`**

```
$ conan create . user/testing
```

With that method in our package recipe, it will copy the executable when installed directly:

```
$ conan install Hello/0.1@user/testing
...
> Hello/0.1@user/testing deploy(): Copied 1 '.exe' files: greet.exe
$ bin\greet.exe
> Hello World!
```

The deploy will create a *deploy_manifest.txt* file with the files that have been deployed.

Sometimes it is useful to adjust the package ID of the deployable package in order to deploy it regardless of the compiler it was compiled with:

```
def package_id(self):
    del self.info.settings.compiler
```

**See also:**

Read more about the *deploy()* method.

### 8.1.4 Running from packages

If a dependency has an executable that we want to run in the conanfile it can be done directly in code using the `run_environment=True` argument. It internally uses a `RunEnvironment` helper. For example, if we want to execute the `greet` app while building the `Consumer` package:

```
from conans import ConanFile, tools, RunEnvironment

class ConsumerConan(ConanFile):
    name = "Consumer"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"
    requires = "Hello/0.1@user/testing"

    def build(self):
        self.run("greet", run_environment=True)
```

Now run **`conan install`** and **`conan build`** for this consumer recipe:

```
$ conan install . && conan build .
...
Project: Running build()
Hello World!
```

Instead of using the environment, it is also possible to explicitly access the path of the dependencies:

```
def build(self):
    path = os.path.join(self.deps_cpp_info["Hello"].rootpath, "bin")
    self.run("%s/greet" % path)
```

Note that this might not be enough if shared libraries exist. Using the `run_environment=True` helper above is a more complete solution.

Finally, there is another approach: the package containing the executable can add its *bin* folder directly to the `PATH`. In this case the **Hello** package conanfile would contain:

```
def package_info(self):
    self.cpp_info.libs = ["hello"]
    self.env_info.PATH = os.path.join(self.package_folder, "bin")
```

We may also define `DYLD_LIBRARY_PATH` and `LD_LIBRARY_PATH` if they are required for the executable.

The consumer package is simple, as the `PATH` environment variable contains the `greet` executable:

```
def build(self):
    self.run("greet")
```

### 8.1.5 Runtime packages and re-packaging

It is possible to create packages that contain only runtime binaries, getting rid of all build-time dependencies. If we want to create a package from the above "Hello" one, but only containing the executable (remember that the above package also contains a library, and the headers), we could do:

```
from conans import ConanFile

class HellorunConan(ConanFile):
    name = "HelloRun"
    version = "0.1"
    build_requires = "Hello/0.1@user/testing"
    keep_imports = True

    def imports(self):
        self.copy("*.exe", dst="bin")

    def package(self):
        self.copy("*")
```

This recipe has the following characteristics:

- It includes the `Hello/0.1@user/testing` package as `build_requires`. That means that it will be used to build this *HelloRun* package, but once the *HelloRun* package is built, it will not be necessary to retrieve it.
- It is using `imports()` to copy from the dependencies, in this case, the executable
- It is using the `keep_imports` attribute to define that imported artifacts during the `build()` step (which is not define, then using the default empty one), are kept and not removed after build
- The `package()` method packages the imported artifacts that will be in the build folder.

To create and upload this package to a remote:

```
$ conan create . user/testing
$ conan upload HelloRun* --all -r=my-remote
```

Installing and running this package can be done using any of the methods presented above. For example:

```
$ conan install HelloRun/0.1@user/testing -g virtualrunenv
# You can specify the remote with -r=my-remote
# It will not install Hello/0.1@...
$ activate_run.sh # $ source activate_run.sh in Unix/Linux
$ greet
> Hello World!
$ deactivate_run.sh # $ source deactivate_run.sh in Unix/Linux
```

## 8.2 Creating conan packages to install dev tools

Conan 1.0 introduced two new settings, `os_build` and `arch_build`. These settings represent the machine where Conan is running, and are important settings when we are packaging tools.

These settings are different from `os` and `arch`. These mean where the built software by the Conan recipe will run. When we are packaging a tool, it usually makes no sense, because we are not building any software, but it makes sense if you are *cross building software*.

We recommend the use of `os_build` and `arch_build` settings instead of `os` and `arch` if you are packaging a tool involved in the building process, like a compiler, a build system etc. If you are building a package to be run on the **host** system you can use `os` and `arch`.

A Conan package for a tool follows always a similar structure, this is a recipe for packaging the `nasm` tool for building assembler:

```
import os
from conans import ConanFile
from conans.client import tools


class NasmConan(ConanFile):
    name = "nasm"
    version = "2.13.01"
    license = "BSD-2-Clause"
    url = "https://github.com/conan-community/conan-nasm-installer"
    settings = "os_build", "arch_build"
    build_policy = "missing"
    description="Nasm for windows. Useful as a build_require."

    def configure(self):
        if self.settings.os_build != "Windows":
            raise Exception("Only windows supported for nasm")

    @property
    def nasm_folder_name(self):
        return "nasm-%s" % self.version

    def build(self):
        suffix = "win32" if self.settings.arch_build == "x86" else "win64"
        nasm_zip_name = "%s-%s.zip" % (self.nasm_folder_name, suffix)
        tools.download("http://www.nasm.us/pub/nasm/releasebuilds/"
                       "%s/%s/%s" % (self.version, suffix, nasm_zip_name), nasm_zip_
↪name)
        self.output.warn("Downloading nasm: "
                         "http://www.nasm.us/pub/nasm/releasebuilds"
                         "/%s/%s/%s" % (self.version, suffix, nasm_zip_name))
        tools.unzip(nasm_zip_name)
        os.unlink(nasm_zip_name)

    def package(self):
        self.copy("*", dst="", keep_path=True)
        self.copy("license*", dst="", src=self.nasm_folder_name, keep_path=False,␣
↪ignore_case=True)

    def package_info(self):
        self.output.info("Using %s version" % self.nasm_folder_name)
        self.env_info.path.append(os.path.join(self.package_folder, self.nasm_folder_
↪name))
```

There are some remarkable things in the recipe:

- The configure method discards some combinations of settings and options, by throwing an exception. In this case this package is only for Windows.
- `build()` downloads the appropriate file and unzips it.
- `package()` copies all the files from the zip to the package folder.

- `package_info()` uses `self.env_info` to append to the environment variable `path` the package's bin folder.

This package has only 2 differences from a regular Conan library package:

- `source()` method is missing. That's because when you compile a library, the source code is always the same for all the generated packages, but in this case we are downloading the binaries, so we do it in the build method to download the appropriate zip file according to each combination of settings/options. Instead of actually building the tools, we just download them. Of course, if you want to build it from source, you can do it too by creating your own package recipe.
- The `package_info()` method uses the new `self.env_info` object. With `self.env_info` the package can declare environment variables that will be set automatically before *build()*, *package()*, *source()* and *imports()* methods of a package requiring this build tool. This is a convenient method to use these tools without having to mess with the system path.

### 8.2.1 Using the tool packages in other recipes

The `self.env_info` variables will be automatically applied when you require a recipe that declares them. For example, take a look at the MinGW *conanfile.py* recipe (https://github.com/conan-community/conan-mingw-installer):

```
class MingwInstallerConan(ConanFile):
    name = "mingw_installer"
    ...

    build_requires = "7z_installer/1.0@conan/stable"

    def build(self):
        keychain = "%s_%s_%s_%s" % (str(self.settings.compiler.version).replace(".",
↪""),
                                    self.settings.arch_build,
                                    self.settings.compiler.exception,
                                    self.settings.compiler.threads)

        files = {
            ...         }

        tools.download(files[keychain], "file.7z")
        self.run("7z x file.7z")

    ...
```

We are requiring a `build_require` to another package: `7z_installer`. In this case it will be used to unzip the 7z compressed files after downloading the appropriate MinGW installer.

That way, after the download of the installer, the 7z executable will be in the PATH, because the `7z_installer` dependency declares the *bin* folder in its `package_info()`.

---

**Important:** Some build requires will need settings such as `os`, `compiler` or `arch` to build themselves from sources. In that case the recipe might look like this:

```
class MyAwesomeBuildTool(ConanFile):
    settings = "os_build", "arch_build", "arch", "compiler"
    ...

    def build(self):
```

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```
        cmake = CMake(self)
        ...

    def package_id(self):
        self.info.include_build_settings()
        del self.info.settings.compiler
        del self.info.settings.arch
```

Note `package_id()` deletes not needed information for the computation of the package ID and includes the build settings `os_build` and `arch_build` that are excluded by default. Read more about *self.info.include_build_settings()* in the reference section.

### 8.2.2 Using the tool packages in your system

You can use the *virtualenv generator* to get the requirements applied in your system. For example: Working in Windows with MinGW and CMake.

1. Create a separate folder from your project, this folder will handle our global development environment.

```
$ mkdir my_cpp_environ
$ cd my_cpp_environ
```

2. Create a *conanfile.txt* file:

```
[requires]
mingw_installer/1.0@conan/stable
cmake_installer/3.10.0@conan/stable

[generators]
virtualenv
```

Note that you can adjust the `options` and retrieve a different configuration of the required packages, or leave them unspecified in the file and pass them as command line parameters.

3. Install them:

```
$ conan install .
```

4. Activate the virtual environment in your shell:

```
$ activate
(my_cpp_environ)$
```

5. Check that the tools are in the path:

```
(my_cpp_environ)$ gcc --version

> gcc (x86_64-posix-seh-rev1, Built by MinGW-W64 project) 4.9.2

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 warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

(my_cpp_environ)$ cmake --version
```

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```
> cmake version 3.10

  CMake suite maintained and supported by Kitware (kitware.com/cmake).
```

6. You can deactivate the virtual environment with the *deactivate.bat* script

```
(my_cpp_environ)$ deactivate
```

## 8.3 Build requirements

There are some requirements that don't feel natural to add to a package recipe. For example, imagine that you had a `cmake/3.4` package in Conan. Would you add it as a requirement to the `ZLib` package, so it will install cmake first in order to build `Zlib`?

In short:

- There are requirements that are only needed when you need to build a package from sources, but if the binary package already exists, you don't want to install or retrieve them.
- These could be dev tools, compilers, build systems, code analyzers, testing libraries, etc.
- They can be very orthogonal to the creation of the package. It doesn't matter whether you build zlib with CMake 3.4, 3.5 or 3.6. As long as the *CMakeLists.txt* is compatible, it will produce the same final package.
- You don't want to add a lot of different versions (like those of CMake) to be able to use them to build the package. You want to easily change the requirements, without needing to edit the zlib package recipe.
- Some of them might not be even be taken into account when a package like zlib is created, such as cross-compiling it to Android (in which the Android toolchain would be a build requirement too).

To address these needs Conan implements `build_requires`.

### 8.3.1 Declaring build requirements

Build requirements can be declared in profiles, like:

Listing 1: my_profile

```
[build_requires]
Tool1/0.1@user/channel
Tool2/0.1@user/channel, Tool3/0.1@user/channel
*: Tool4/0.1@user/channel
MyPkg*: Tool5/0.1@user/channel
&: Tool6/0.1@user/channel
&!: Tool7/0.1@user/channel
```

Build requirements are specified by a `pattern:`. If such pattern is not specified, it will be assumed to be `*`, i.e. to apply to all packages. Packages can be declared in different lines or by a comma separated list. In this example, `Tool1`, `Tool2`, `Tool3` and `Tool4` will be used for all packages in the dependency graph (while running **`conan install`** or **`conan create`**).

If a pattern like `MyPkg*` is specified, the declared build requirements will only be applied to packages matching that pattern. `Tool5` will not be applied to Zlib for example, but it will be applied to `MyPkgZlib`.

The special case of a **consumer** conanfile (without name or version) it is impossible to match with a pattern, so it is handled with the special character `&`:

- `&` means apply these build requirements to the consumer conanfile
- `&!` means apply the build requirements to all packages except the consumer one.

Remember that the consumer conanfile is the one inside the *test_package* folder or the one referenced in the **conan install** command.

Build requirements can be also specified in a package recipe, with the `build_requires` attribute and the `build_requirements()` method:

```
class MyPkg(ConanFile):
    build_requires = "ToolA/0.2@user/testing", "ToolB/0.2@user/testing"

    def build_requirements(self):
        # useful for example for conditional build_requires
        # This means, if we are running on a Windows machine, require ToolWin
        if platform.system() == "Windows":
            self.build_requires("ToolWin/0.1@user/stable")
```

The above `ToolA` and `ToolB` will be always retrieved and used for building this recipe, while the `ToolWin` one will only be used only in Windows.

If some build requirement defined inside `build_requirements()` has the same package name as the one defined in the `build_requires` attribute, the one inside the `build_requirements()` method will prevail.

As a rule of thumb, downstream defined values always override upstream dependency values. If some build requirement is defined in the profile, it will overwrite the build requirements defined in package recipes that have the same package name.

### 8.3.2 Properties of build requirements

The behavior of `build_requires` is the same irrespective if they are defined in the profile or if defined in the package recipe.

- They will only be retrieved and installed if some package that has to be built from sources and matches the declared pattern. Otherwise, they will not be even checked for existence.
- Options and environment variables declared in the profile as well as in the command line will affect the build requirements for packages. In that way, you can define for example for the `cmake_installer/0.1` package which CMake version will be installed.
- Build requirements will be activated for matching packages via the `deps_cpp_info` and `deps_env_info` members. So, include directories, library names, compile flags (CFLAGS, CXXFLAGS, LINKFLAGS), sysroot, etc. will be applied from the build requirement's package `self.cpp_info` values. The same for `self.env_info`: variables such as `PATH`, `PYTHONPATH`, and any other environment variables will be applied to the matching patterns and activated as environment variables.
- Build requirements can also be transitive. They can declare their own requirements, both normal requirements and their own build requirements. Normal logic for dependency graph resolution applies, such as conflict resolution and dependency overriding.
- Each matching pattern will produce a different dependency graph of build requirements. These graphs are cached so that they are only computed once. If a build requirement applies to different packages with the same configuration it will only be installed once (same behavior as normal dependencies - once they are cached locally, there is no need to retrieve or build them again).

- Build requirements do not affect the binary package ID. If using a different build requirement produces a different binary, you should consider adding an option or a setting to model that (if not already modeled).
- Can also use version-ranges, like `Tool/[>0.3]@user/channel`.
- Build requirements are not listed in **`conan info`** nor are represented in the graph (with **`conan info --graph`**).

### 8.3.3 Testing libraries

One example of build requirement could be a testing framework, which is implemented as a library. Let's call it `mytest_framework`, an existing Conan package.

Build requirements can be checked for existence (whether they've been applied) in the recipes, which can be useful for conditional logic in the recipes. In this example, we could have one recipe with the following `build()` method:

```
def build(self):
    cmake = CMake(self)
    enable_testing = "mytest_framework" in self.deps_cpp_info.deps
    cmake.configure(defs={"ENABLE_TESTING": enable_testing})
    cmake.build()
    if enable_testing:
        cmake.test()
```

And the package *CMakeLists.txt*:

```
project(PackageTest CXX)
cmake_minimum_required(VERSION 2.8.12)

include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()
if(ENABLE_TESTING)
    add_executable(example test.cpp)
    target_link_libraries(example ${CONAN_LIBS})

    enable_testing()
    add_test(NAME example
             WORKING_DIRECTORY ${CMAKE_BINARY_DIR}/bin
             COMMAND example)
endif()
```

This package recipe will not retrieve the `mytest_framework` nor build the tests, for normal installation:

```
$ conan install .
```

But if the following profile is defined:

Listing 2: mytest_profile

```
 [build_requires]
 mytest_framework/0.1@user/channel
```

Then the install command will retrieve the `mytest_framework`, build and run the tests:

```
$ conan install . --profile=mytest_profile
```

### 8.3.4 Common python code

The same technique can be even used to inject and reuse python code in the package recipes, without having to declare dependencies to such python packages.

If a Conan package is defined to wrap and reuse the *mypythontool.py* file:

```
import os
from conans import ConanFile

class Tool(ConanFile):
    name = "PythonTool"
    version = "0.1"
    exports_sources = "mypythontool.py"

    def package(self):
        self.copy("mypythontool.py")

    def package_info(self):
        self.env_info.PYTHONPATH.append(self.package_folder)
```

Then if it is defined in a profile as a build require:

```
[build_requires]
PythonTool/0.1@user/channel
```

such package can be reused in other recipes like this:

```
def build(self):
    self.run("mytool")
    import mypythontool
    self.output.info(mypythontool.hello_world())
```

CHAPTER

NINE

# MASTERING CONAN

This section provides an introduction to important productivity features and useful functionalities of Conan:

## 9.1 Use conanfile.py for consumers

You can use a `conanfile.py` for installing/consuming packages, even if you are not creating a package with it. You can also use the existing `conanfile.py` in a given package while developing it to install dependencies, no need to have a separate `conanfile.txt`.

Let's take a look at the complete `conanfile.txt` from the previous *timer* example with POCO library, in which we have added a couple of extra generators

```
[requires]
Poco/1.7.8p3@pocoproject/stable

[generators]
gcc
cmake
txt

[options]
Poco:shared=True
OpenSSL:shared=True

[imports]
bin, *.dll -> ./bin # Copies all dll files from the package "bin" folder to my␣
↪project "bin" folder
lib, *.dylib* -> ./bin # Copies all dylib files from the package "lib" folder to my␣
↪project "bin" folder
```

The equivalent `conanfile.py` file is:

```
from conans import ConanFile, CMake

class PocoTimerConan(ConanFile):
    settings = "os", "compiler", "build_type", "arch"
    requires = "Poco/1.7.8p3@pocoproject/stable" # comma-separated list of requirements
    generators = "cmake", "gcc", "txt"
    default_options = {"Poco:shared": True, "OpenSSL:shared": True}

    def imports(self):
        self.copy("*.dll", dst="bin", src="bin") # From bin to bin
        self.copy("*.dylib*", dst="bin", src="lib") # From lib to bin
```

Note that this `conanfile.py` doesn't have a name, version, or `build()` or `package()` method, as it is not creating a package, they are not required.

With this `conanfile.py` you can just work as usual, nothing changes from the user's perspective. You can install the requirements with (from mytimer/build folder):

```
$ conan install ..
```

### 9.1.1 conan build

One advantage of using `conanfile.py` is that the project build can be further simplified, using the conanfile.py `build()` method.

If you are building your project with CMake, edit your `conanfile.py` and add the following `build()` method:

```
from conans import ConanFile, CMake

class PocoTimerConan(ConanFile):
    settings = "os", "compiler", "build_type", "arch"
    requires = "Poco/1.7.8p3@pocoproject/stable"
    generators = "cmake", "gcc", "txt"
    default_options = {"Poco:shared": True, "OpenSSL:shared": True}

    def imports(self):
        self.copy("*.dll", dst="bin", src="bin") # From bin to bin
        self.copy("*.dylib*", dst="bin", src="lib") # From lib to bin

    def build(self):
        cmake = CMake(self)
        cmake.configure()
        cmake.build()
```

Then execute, from your project root:

```
$ conan install . --install-folder build
$ conan build . --build-folder build
```

The **`conan install`** command downloads and prepares the requirements of your project (for the specified settings) and the **`conan build`** command uses all that information to invoke your `build()` method to build your project, which in turn calls `cmake`.

This **`conan build`** will use the settings used in the **`conan install`** which have been cached in the local *conaninfo.txt* and file in your build folder, which simplifies the process and reduces the errors of mismatches between the installed packages and the current project configuration. Also, the *conanbuildinfo.txt* file contains all the needed information obtained from the requirements: `deps_cpp_info`, `deps_env_info`, `deps_user_info` objects.

If you want to build your project for **x86** or another setting just change the parameters passed to **`conan install`**:

```
$ conan install . --install-folder build_x86 -s arch=x86
$ conan build . --build-folder build_x86
```

Implementing and using the conanfile.py `build()` method ensures that we always use the same settings both in the installation of requirements and the build of the project, and simplifies calling the build system.

### 9.1.2 Other local commands

Conan implements other commands that can be executed locally over a consumer `conanfile.py` which is in user space, not in the local cache:

- **`conan source <path>`**: Execute locally the *conanfile.py* `source()` method.
- **`conan package <path>`**: Execute locally the *conanfile.py* `package()` method.

These commands are mostly used for testing and debugging while developing a new package, before **exporting** such package recipe into the local cache.

**See also:**

Check the section *Reference/Commands* to find out more.

## 9.2 Conditional settings, options and requirements

Remember, in your `conanfile.py` you have also access to the options of your dependencies, and you can use them to:

- Add requirements dynamically
- Change values of options

The **configure** method might be used to hardcode dependencies options values. It is strongly discouraged to use it to change the settings values, please remember that `settings` are a configuration *input*, so it doesn't make sense to modify it in the recipes.

Also, for options, a more flexible solution is to define dependencies options values in the `default_options`, not in the `configure()` method, as this would allow to override them. Hardcoding them in the `configure()` method won't allow that and thus won't easily allow conflict resolution. Use it only when it is absolutely necessary that the package dependencies use those options.

Here is an example of what we could do in our **configure method**:

```
...
requires = "Poco/1.9.0@pocoproject/stable" # We will add OpenSSL dynamically "OpenSSL/
↪1.0.2d@lasote/stable"
...

def configure(self):
    # We can control the options of our dependencies based on current options
    self.options["OpenSSL"].shared = self.options.shared

    # Maybe in windows we know that OpenSSL works better as shared (false)
    if self.settings.os == "Windows":
       self.options["OpenSSL"].shared = True

       # Or adjust any other available option
       self.options["Poco"].other_option = "foo"

    # We could check the presence of an option
    if "shared" in self.options:
        pass

def requirements(self):
    # Or add a new requirement!
```

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```
    if self.options.testing:
        self.requires("OpenSSL/2.1@memsharded/testing")
    else:
        self.requires("OpenSSL/1.0.2d@lasote/stable")
```

### 9.2.1 Constrain settings and options

Sometimes there are libraries that are not compatible with specific settings like libraries that are not compatible with an architecture or options that only make sense for an operating system. It can be also useful when there are settings under development.

There are two approaches for this situation:

- **Use `configure()` to raise an error for non-supported configurations**:

  This approach is the first one evaluated when Conan loads the recipe so it is quite handy to perform checks of the input settings. It relies on the set of possible settings inside your *settings.yml* file so it can be used to constrain any recipe.

  ```
  def configure(self):
      if self.settings.os == "Windows":
        raise ConanInvalidConfiguration("This library is not compatible with Windows
  ↪")
  ```

  This same method is also valid for `options` and `config_options()` method and it is commonly used to remove options for one setting:

  ```
  def config_options(self):
      if self.settings.os == "Windows":
          del self.options.fPIC
  ```

- **Constrain settings inside a recipe**:

  This approach constrains the settings inside a recipe to a subset of them and it is normally used in recipes that are never supposed to work out of the restricted settings.

  ```
  from conans import ConanFile

  class MyConan(ConanFile):
      name = "myconanlibrary"
      version = "1.0.0"
      settings = {"os": None, "build_type": None, "compiler": None, "arch": ["x86_64
  ↪"]}
  ```

  The disadvantage of this is that possible settings are hardcoded in the recipe and in case new values are used in the future, it will require the recipe to be modified explicitly.

  ---

  **Important:** Note the use of `None` value in the `os`, `compiler` and `build_type` settings described above will allow them to take the values from *settings.yml* file

  ---

We strongly recommend the use if the first approach whenever it is possible and use the second one only for those cases where a stronger constrain is needed for a particular recipe.

**See also:**

Check the reference section *configure(), config_options()* to find out more.

## 9.3 Version ranges

Version range expressions are supported, both in `conanfile.txt` and in `conanfile.py` requirements.

The syntax is using brackets. The square brackets are the way to specify conan that is a version range. Otherwise, versions are plain strings, they can be whatever you want them to be (up to limitations of length and allowed characters).

```
class HelloConan(ConanFile):
    requires = "Pkg/[>1.0 <1.8]@user/stable"
```

So when specifying `Pkg/[expression]@user/stable` it means that `expression` will be evaluated as a version range. Otherwise it will be understand as plain text, so `requires = "Pkg/version@user/stable"` always means to use the version `version` literally.

There are some packages that do not follow semver, a popular one would be the OpenSSL package with versions as `1.0.2n`. They cannot be used with version-ranges, to require such packages you always have to use explicit versions (without brackets).

The process to manage plain versions vs version-ranges is also different. The second one requires a "search" in the remote, which is orders of magnitude slower than direct retrieval of the reference (plain versions), so take it into account if you plan to use it for very large projects.

Expressions are those defined and implemented by https://pypi.org/project/node-semver/. Accepted expressions would be:

```
[>1.1 <2.1]                 # In such range
[2.8]                       # equivalent to =2.8
[~=3.0]                     # compatible, according to semver
[>1.1 || 0.8]               # conditions can be OR'ed
[1.2.7 || >=1.2.9 <2.0.0]   # This range would match the versions 1.2.7, 1.2.9, and 1.
↪4.6, but not the versions 1.2.8 or 2.0.0.
```

Version range expressions are evaluated at the time of building the dependency graph, from downstream to upstream dependencies. No joint-compatibility of the full graph is computed, instead, version ranges are evaluated when dependencies are first retrieved.

This means, that if a package A depends on another package B (A->B), and A has a requirement for `C/[>1.2 <1.8]`, this requirement is evaluated first and it can lead to get the version `C/1.7`. If package B has the requirement to `C/[>1.3 <1.6]`, this one will be overwritten by the downstream one, it will output a version incompatibility error. But the "joint" compatibility of the graph will not be obtained. Downstream packages or consumer projects can impose their own requirements to comply with upstream constraints, in this case a override dependency to `C/[>1.3 <1.6]` can be easily defined in the downstream package or project.

The order of search for matching versions is as follows:

- First, the local conan storage is searched for matching versions, unless the **`--update`** flag is provided to **`conan install`**.
- If a matching version is found, it is used in the dependency graph as a solution.
- If no matching version is locally found, it starts to search in the remotes, in order. If some remote is specified with **`-r=remote`**, then only that remote will be used.
- If the **`--update`** parameter is used, then the existing packages in the local conan cache will not be used, and the same search of the previous steps is carried out in the remotes. If new matching versions are found, they will be retrieved, so subsequent calls to **`install`** will find them locally and use them.

## 9.4 Build policies

By default, **conan install** command will search for a binary package (corresponding to our settings and defined options) in a remote, if it's not present the install command will fail.

As previously demonstrated, we can use the **--build** option to change the default **conan install** behavior:

- **--build some_package** will build only "some_package".
- **--build missing** will build only the missing requires.
- **--build** will build all requirements from sources.
- **--build outdated** will try to build from code if the binary is not built with the current recipe or when missing binary package.

With the `build_policy` attribute the package creator can change the default conan's build behavior. The allowed build_policy values are:

- `missing`: If no binary package is found, conan will build it without the need of invoke conan install with **--build missing** option.
- `always`: The package will be built always, **retrieving each time the source code** executing the "source" method.

```
class PocoTimerConan(ConanFile):
    settings = "os", "compiler", "build_type", "arch"
    requires = "Poco/1.7.8p3@pocoproject/stable" # comma-separated list of␣
↪requirements
    generators = "cmake", "gcc", "txt"
    default_options = {"Poco:shared": True, "OpenSSL:shared": True}
    build_policy = "always" # "missing"
```

These build policies are especially useful if the package creator doesn't want to provide binary package, for example, with header only libraries.

The `always` policy, will retrieve the sources each time the package is installed so it can be useful for providing a "latest" mechanism or ignoring the uploaded binary packages.

## 9.5 Environment variables

There are several use cases for environment variables:

- Conan global configuration environment variables (e.g. `CONAN_COMPRESSION_LEVEL`). They can be configured in *conan.conf* or as system environment variables, and control conan behavior.
- Package recipes can access environment variables to determine their behavior. A typical example would be when launching CMake, it will check for CC and CXX environment variables to define the compiler to use. These variables are mostly transparent for conan, and just used by the package recipes.
- **Environment variables can be set in different ways:**
  - global, at the OS level, with **export VAR=Value** or in Windows **SET VAR=Value**.
  - In the conan command line: **conan install -e VAR=Value**.
  - In profile files.
  - In package recipes in the `self.env_info` field, so they are activated for dependent recipes.

### 9.5.1 Defining environment variables

You can use *profiles* to define environment variables that will apply to your recipes. You can also use **-e** parameter in **conan install**, **conan info** and **conan create** commands.

```
[env]
CC=/usr/bin/clang
CXX=/usr/bin/clang++
```

If you want to override an environment variable that a package has inherited from its requirements, you can use either **profiles** or **-e** to do it:

```
conan install . -e MyPackage:PATH=/other/path
```

If you want to define an environment variable but you want to append the variables declared in your requirements you can use the `[]` syntax:

```
$ conan install . -e PYTHONPATH=[/other/path]
```

This way the first entry in the PYTHONPATH variable will be */other/path* but the PYTHONPATH values declared in the requirements of the project will be appended at the end using the system path separator.

### 9.5.2 Automatic environment variables inheritance

If your dependencies define some `env_info` variables in the `package_info()` method they will be automatically applied before calling the consumer *conanfile.py* methods `source()`, `build()`, `package()` and `imports()`. You can read more about `env_info` object *here*.

For example, if you are creating a package for a tool, you can define the variable `PATH`:

```
class ToolExampleConan(ConanFile):
    name = "my_tool_installer"
    ...

    def package_info(self):
        self.env_info.path.append(os.path.join(self.package_folder, "bin"))
```

If another conan recipe requires the *my_tool_installer* in the `source()`, `build()`, `package()` and `imports()` the bin folder of the `my_tool_installer` package will be automatically appended to the system PATH. If `my_tool_installer` packages an executable called `my_tool_executable` in the *bin* of the package folder we can directly call the tool, because it will be available in the path:

```
class MyLibExample(ConanFile):
    name = "my_lib_example"
    ...

    def build(self):
        self.run("my_tool_executable some_arguments")
```

You could also set `CC`, `CXX` variables if we are packing a compiler to define what compiler to use or any other environment variable. Read more about tool packages *here*.

## 9.6 Virtual Environments

Conan offer three special conan generators to create virtual environments:

- `virtualenv`: Declares the *self.env_info* variables of the requirements.
- `virtualbuildenv`: Special build environment variables for autotools/visual studio.
- `virtualrunenv`: Special environment variables to locate executables and shared libraries in the requirements.

These virtual environment generators create two executable script files (.sh or .bat depending on the current operating system), one for `activate` the virtual environment (set the environment variables) and one for `deactivate` it.

You can aggregate two or more virtual environments, that means that you can activate a `virtualenv` and then activate a `virtualrunenv` so you will have available the environment variables declared in the `env_info` object of the requirements plus the special environment variables to locate executables and shared libraries.

### 9.6.1 Virtualenv generator

Conan provides a **virtualenv** generator, able to read from each dependency the *self.env_info* variables declared in the `package_info()` method and generate two scripts "activate" and "deactivate". These scripts set/unset all env variables in the current shell.

**Example**:

The recipe of `cmake_installer/3.9.0@conan/stable` appends to the PATH variable the package folder/bin.

You can check existing CMake conan package versions in conan-center with:

```
$ conan search cmake* -r=conan-center
```

In the **bin** folder there is a **cmake** executable:

```
def package_info(self):
  self.env_info.path.append(os.path.join(self.package_folder, "bin"))
```

Let's prepare a virtual environment to have available our cmake in the path, open `conanfile.txt` and change (or add) **virtualenv** generator:

```
[requires]
cmake_installer/3.9.0@conan/stable

[generators]
virtualenv
```

Run **`conan install`**:

```
$ conan install .
```

You can also avoid the creation of the *conanfile.txt* completely and directly do:

```
$ conan install cmake_installer/3.9.0@conan/stable -g=virtualenv
```

And activate the virtual environment, and now you can run `cmake --version` and check that you have the installed CMake in path.

```
$ source activate.sh # Windows: activate.bat without the source
$ cmake --version
```

Two sets of scripts are available for Windows - `activate.bat`/`deactivate.bat` and `activate.ps1`/`deactivate.ps1` if you are using powershell. Deactivate the virtual environment (or close the console) to restore the environment variables:

```
$ source deactivate.sh # Windows: deactivate.bat without the source
```

**See also:**

Read the Howto *Create installer packages* to know more about virtual environment feature. Check the section *Reference/virtualenv* to see the reference of the generator.

### 9.6.2 Virtualbuildenv environment

Use the generator `virtualbuildenv` to activate an environment that will set the environment variables for Autotools and Visual Studio.

The generator will create `activate_build` and `deactivate_build` files.

**See also:**

Read More about the building environment variables defined in the sections *Building with autotools* and *Build with Visual Studio*.

Check the section *Reference/virtualbuildenv* to see the reference of the generator.

### 9.6.3 Virtualrunenv generator

Use the generator `virtualrunenv` to activate an environment that will:

- Append to `PATH` environment variable every `bin` folder of your requirements.
- Append to `LD_LIBRARY_PATH` and `DYLD_LIBRARY_PATH` environment variables each `lib` folder of your requirements.

The generator will create `activate_run` and `deactivate_run` files. This generator is especially useful:

- If you are requiring packages with shared libraries and you are running some executable that needs those libraries.
- If you have a requirement with some tool (executable) and you need it in the path.

In the previous example of the `cmake_installer` recipe, even if the cmake_installer package doesn't declare the `self.env_info.path` variable, using the virtualrunenv generator, the `bin` folder of the package will be available in the PATH. So after activating the virtual environment we could just run `cmake` and we will be executing the cmake of the package.

**See also:**

- *Reference/Tools/environment_append*

## 9.7 Logging

### 9.7.1 How to log and debug a conan execution

You can use the *CONAN_TRACE_FILE* environment variable to log and debug several conan command execution. Set the `CONAN_TRACE_FILE` environment variable pointing to a log file.

Example:

```
export CONAN_TRACE_FILE=/tmp/conan_trace.log # Or SET in windows
conan install zlib/1.2.8@lasote/stable
```

The */tmp/conan_trace.log* file:


```
{"_action": "COMMAND", "name": "install", "parameters": {"all": false, "build": null,
↪"env": null, "file": null, "generator": null, "manifests": null, "manifests_
↪interactive": null, "no_imports": false, "options": null, "package": null, "profile
↪": null, "reference": "zlib/1.2.8@lasote/stable", "remote": null, "scope": null,
↪"settings": null, "update": false, "verify": null, "werror": false}, "time":␣
↪1485345289.250117}
{"_action": "REST_API_CALL", "duration": 1.8255090713500977, "headers": {
↪"Authorization": "**********", "X-Client-Anonymous-Id": "**********", "X-Client-Id
↪": "lasote2", "X-Conan-Client-Version": "0.19.0-dev"}, "method": "GET", "time":␣
↪1485345291.092218, "url": "https://server.conan.io/v1/conans/zlib/1.2.8/lasote/
↪stable/download_urls"}
{"_action": "DOWNLOAD", "duration": 0.4136989116668701, "time": 1485345291.506399,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/export/conanmanifest.txt"}
{"_action": "DOWNLOAD", "duration": 0.10367798805236816, "time": 1485345291.610335,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/export/conanfile.py"}
{"_action": "DOWNLOAD", "duration": 0.059114933013916016, "time": 1485345291.669744,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/export/conan_export.tgz"}
{"_action": "DOWNLOADED_RECIPE", "_id": "zlib/1.2.8@lasote/stable", "duration": 2.
↪40762996673584, "files": {"conan_export.tgz": "/home/laso/.conan/data/zlib/1.2.8/
↪lasote/stable/export/conan_export.tgz", "conanfile.py": "/home/laso/.conan/data/
↪zlib/1.2.8/lasote/stable/export/conanfile.py", "conanmanifest.txt": "/home/laso/.
↪conan/data/zlib/1.2.8/lasote/stable/export/conanmanifest.txt"}, "remote": "conan.io
↪", "time": 1485345291.670017}
{"_action": "REST_API_CALL", "duration": 0.4844989776611328, "headers": {
↪"Authorization": "**********", "X-Client-Anonymous-Id": "**********", "X-Client-Id
↪": "lasote2", "X-Conan-Client-Version": "0.19.0-dev"}, "method": "GET", "time":␣
↪1485345292.160912, "url": "https://server.conan.io/v1/conans/zlib/1.2.8/lasote/
↪stable/packages/c6d75a933080ca17eb7f076813e7fb21aaa740f2/download_urls"}
{"_action": "DOWNLOAD", "duration": 0.06388187408447266, "time": 1485345292.225308,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/package/c6d75a933080ca17eb7f076813e7fb21aaa740f2/conaninfo.txt?
↪Signature=c1KAOqvxtCUnnQOeYizZ9bgcwwY%3D&Expires=1485352492&
↪AWSAccessKeyId=AKIAJXMWDMVCDMAZQK5Q"}
{"_action": "REST_API_CALL", "duration": 0.8182470798492432, "headers": {
↪"Authorization": "**********", "X-Client-Anonymous-Id": "**********", "X-Client-Id
↪": "lasote2", "X-Conan-Client-Version": "0.19.0-dev"}, "method": "GET", "time":␣
↪1485345293.044904, "url": "https://server.conan.io/v1/conans/zlib/1.2.8/lasote/
↪stable/packages/c6d75a933080ca17eb7f076813e7fb21aaa740f2/download_urls"}
{"_action": "DOWNLOAD", "duration": 0.07849907875061035, "time": 1485345293.123831,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/package/c6d75a933080ca17eb7f076813e7fb21aaa740f2/conanmanifest.txt"}
{"_action": "DOWNLOAD", "duration": 0.06638002395629883, "time": 1485345293.190465,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/package/c6d75a933080ca17eb7f076813e7fb21aaa740f2/conaninfo.txt"}
{"_action": "DOWNLOAD", "duration": 0.3634459972381592, "time": 1485345293.554206,
↪"url": "https://conanio-production.s3.amazonaws.com/storage/zlib/1.2.8/lasote/
↪stable/package/c6d75a933080ca17eb7f076813e7fb21aaa740f2/conan_package.tgz"}
{"_action": "DOWNLOADED_PACKAGE", "_id": "zlib/1.2.8@lasote/
↪stable:c6d75a933080ca17eb7f076813e7fb21aaa740f2", "duration": 1.3279249668121338,
↪"files": {"conan_package.tgz": "/home/laso/.conan/data/zlib/1.2.8/lasote/stable/
↪package/c6d75a933080ca17eb7f076813e7fb21aaa740f2/conan_package.tgz", "conaninfo.txt
↪": "/home/laso/.conan/data/zlib/1.2.8/lasote/stable/package/
↪c6d75a933080ca17eb7f076813e7fb21aaa740f2/conaninfo.txt", "conanmanifest.txt": "/
↪home/laso/.conan/data/zlib/1.2.8/lasote/stable/package/
↪c6d75a933080ca17eb7f076813e7fb21aaa740f2/conanmanifest.txt"}, "remote": "conan.io",
↪"time": 1485345293.554466}
```


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In the traces we can see:

1. A command `install` execution.
2. A rest api call to get some `download_urls`.
3. Three files downloaded (corresponding to the previously retrieved urls).
4. `DOWNLOADED_RECIPE` tells us that the recipe retrieving is finished. We can see that the whole retrieve process took 2.4 seconds.
5. conan client has computed the needed binary package SHA and now will get it. So will request and download the package `package_id` file to perform some checks like outdated binaries.
6. Another rest api call to get some more `download_urls`, for the package files and download them.
7. Finally we get a `DOWNLOADED_PACKAGE` telling us that the package has been downloaded. It took 1.3 seconds.

If we execute conan install again:

```
export CONAN_TRACE_FILE=/tmp/conan_trace.log # Or SET in windows
conan install zlib/1.2.8@lasote/stable
```

The */tmp/conan_trace.log* file only three lines will be appended:

```
{"_action": "COMMAND", "name": "install", "parameters": {"all": false, "build": null,
↪"env": null, "file": null, "generator": null, "manifests": null, "manifests_
↪interactive": null, "no_imports": false, "options": null, "package": null, "profile
↪": null, "reference": "zlib/1.2.8@lasote/stable", "remote": null, "scope": null,
↪"settings": null, "update": false, "verify": null, "werror": false}, "time":␣
↪1485346039.817543}
{"_action": "GOT_RECIPE_FROM_LOCAL_CACHE", "_id": "zlib/1.2.8@lasote/stable", "time":␣
↪1485346039.824949}
{"_action": "GOT_PACKAGE_FROM_LOCAL_CACHE", "_id": "zlib/1.2.8@lasote/
↪stable:c6d75a933080ca17eb7f076813e7fb21aaa740f2", "time": 1485346039.827915}
```

1. A command `install` execution.
2. A `GOT_RECIPE_FROM_LOCAL_CACHE` because we already have it available in local cache.
3. A `GOT_PACKAGE_FROM_LOCAL_CACHE` because the package is cached too.

### 9.7.2 How to log the build process

You can log your command executions `self.run` in a file named *conan_run.log* using the environment variable *CONAN_LOG_RUN_TO_FILE*.

You can also use the variable *CONAN_PRINT_RUN_COMMANDS* to log extra information about the commands being executed.

#### Package the log files

The *conan_run.log* file will be available in your *build* folder so you can package it the same way you package a library file:

```
def package(self):
    self.copy(pattern="conan_run.log", dst="", keep_path=False)
```

## 9.8 Sharing the settings and other configuration

If you are using Conan in a company or in an organization, sometimes you need to share the *settings.yml* file or the *profiles*, or even the *remotes* or any other conan local configuration with the team.

You can use the **conan config install**.

If you want to try this feature without affecting to your current configuration you can declare the CONAN_USER_HOME environment variable and point to a different directory.

Read more in the section *reference/commands/conan config install*.

## 9.9 Conan local cache: concurrency, Continuous Integration, isolation

Conan needs access to some, per user, configuration files, as the **conan.conf** file that defines the basic client app configuration. By convention, this file will be located in the user home folder **~/.conan/**. This folder will typically also store the package cache, in **~/.conan/data**. Though the latter is configurable in *conan.conf*, conan needs some place to look for this initial configuration file.

There are some scenarios in which you might want to use different initial locations for the conan client application:

- Continuous Integration (CI) environments, in which multiple jobs can also work concurrently. Moreover, these environments would typically want to run with different user credentials, different remote configurations, etc. Note that using Continuous Integration with the same user, with isolated machine instances (virtual machines), or with sequential jobs is perfectly possible. For example, we use a lot CI cloud services of travis-ci and appveyor.
- Independent per project management and storage. If as a single developer you want to manage different projects with different user credentials and/or different remotes, you might find that having multiple independent caches makes it easier.

Using different caches is very simple. You can just define the environment variable **CONAN_USER_HOME**. By setting this variable to different paths, you have multiple conan caches, something like python "virtualenvs". Just changing the value of **CONAN_USER_HOME** you can switch among isolated conan instances that will have independent package storage caches, but also different user credentials, different user default settings, and different remotes configuration.

---

**Note:** Use an absolute path or a path starting with ~/ (relative to user home). In Windows do not use quotes.

---

Windows users:

```
$ SET CONAN_USER_HOME=c:\data
$ conan install . # call conan normally, config & data will be in c:\data
```

Linux/macOS users:

```
$ export CONAN_USER_HOME=/tmp/conan
$ conan install . # call conan normally, config & data will be in /tmp/conan
```

You can now:

- Build concurrent jobs, parallel builds in Continuous Integration or locally, just setting the variable before launching conan commands.

- You can test locally different user credentials, default configurations, different remotes, just by switching from one cache to the others.

```
$ export CONAN_USER_HOME=/tmp/conan
$ conan search  # using that /tmp/conan cache
$ conan user  # using that /tmp/conan cache

$ export CONAN_USER_HOME=/tmp/conan2
$ conan search  # different packages
$ conan user  # can be different users

$ export CONAN_USER_HOME=/tmp/conan  # just go back to use the other cache
```

### 9.9.1 Concurrency

Conan local cache support some degree of concurrency, allowing simultaneous creation or installation of different packages, or building different binaries for the same package. However, concurrent operations like removal of packages while creating them will fail. If you need different environments that operate totally independently, you probably want to use different conan caches for that.

The concurrency is implemented with a Readers-Writers lock mechanism, which in turn uses `fasteners` library file locks to achieve multi-platform portability. As this "mutex" resource is by definition not enough to implement a Readers-Writers solution, some active-wait with time sleeps in a loop is necessary. However, this time sleeps will be rare, only sleeping when there is actually a collision and waiting on a lock.

The lock files will be stored inside each `Pkg/version/user/channel` folder in the local cache, in a `rw` file for locking the entire package, or in a set of locks (one per each different binary package, under a subfolder called `locks`, each lock named with the binary ID of the package).

It is possible to disable the locking mechanism in `conan.conf`:

```
[general]
cache_no_locks = True
```

CHAPTER

TEN

# SYSTEMS AND CROSS BUILDING

This section explains how to cross build with Conan to any platform and the Windows subsystems (Cygwin, MSYS2).

## 10.1 Cross building

Cross building is compiling a library or executable in one platform to be used in a different one.

Cross-compilation is used to build software for embedded devices where you don't have an operating system nor a compiler available. Also for building software for not too fast devices, like an Android machine, a Raspberry PI etc.

To cross build code you need the right toolchain. A toolchain is basically a compiler with a set of libraries matching the `host` platform.

### 10.1.1 GNU triplet convention

According to the GNU convention, there are three platforms involved in the software building:

- **Build platform:** The platform on which the compilation tools are executed
- **Host platform:** The platform on which the code will run
- **Target platform:** Only when building a compiler, this is the platform that the compiler will generate code for

When you are building code for your own machine it's called **native building**, where the `build` and the `host` platforms are the same. The `target` platform is not defined in this situation.

When you are building code for a different platform, it's called **cross building**, where the `build` platform is different from the `host` platform. The `target` platform is not defined in this situation.

The use of the `target` platform is rarely needed, only makes sense when you are building a compiler. For instance, when you are building in your Linux machine a GCC compiler that will run on Windows, to generate code for Android. Here, the `build` is your Linux computer, the `host` is the Windows computer and the `target` is Android.

### 10.1.2 Conan settings

From version 1.0, Conan introduces new settings to model the GNU convention triplet:

`build` platform settings:

- **os_build**: Operating system of the `build` system.

- **arch_build**: Architecture system of the `build` system.

These settings are detected the first time you run Conan with the same values than the `host` settings, so by default, we are doing **native building**. Probably you will never need to change the value of this settings because they describe where are you running Conan.

`host` platform settings:

- **os**: Operating system of the `host` system.
- **arch**: Architecture of the `host` system.
- **compiler**: Compiler of the `host` system (to declare compatibility of libs in the host platform)
- ... (all the regular settings)

These settings are the regular Conan settings, already present before supporting the GNU triplet convention. If you are cross building you have to change them according to the `host` platform.

`target` platform:

- **os_target**: Operating system of the `target` system.
- **arch_target**: Architecture of the `target` system.

If you are building a compiler, specify with these settings where the compiled code will run.

### 10.1.3 Cross building with Conan

If you want to cross-build a Conan package, for example, in your Linux machine, build the *zlib* Conan package for Windows, you need to indicate to Conan where to find your cross-compiler/toolchain.

There are two approaches:

- Install the toolchain in your computer and use a `profile` to declare the settings and point to the needed tools/libraries in the toolchain using the `[env]` section to declare, at least, the `CC` and `CXX` environment variables.
- Package the toolchain as a Conan package and include it as a `build_require`.

#### Using profiles

Create a profile with:

- A **[settings]** section containing the needed settings: `os_build`, `arch_build` and the regular settings `os`, `arch`, `compiler`, `build_type` and so on.
- An **[env]** section with a PATH variable pointing to your installed toolchain. Also any other variable that the toolchain expects (read the docs of your compiler). Some build systems need a variable `SYSROOT` to locate where the host system libraries and tools are.

#### Linux to Windows

- Install the needed toolchain, in ubuntu:

```
sudo apt-get install g++-mingw-w64 gcc-mingw-w64
```

- Create a file named **linux_to_win64** with the contents:

```
$toolchain=/usr/x86_64-w64-mingw32 # Adjust this path
target_host=x86_64-w64-mingw32
cc_compiler=gcc
cxx_compiler=g++

[env]
CONAN_CMAKE_FIND_ROOT_PATH=$toolchain
CHOST=$target_host
AR=$target_host-ar
AS=$target_host-as
RANLIB=$target_host-ranlib
CC=$target_host-$cc_compiler
CXX=$target_host-$cxx_compiler
STRIP=$target_host-strip
RC=$target_host-windres

[settings]
# We are building in Ubuntu Linux
os_build=Linux
arch_build=x86_64

# We are cross building to Windows
os=Windows
arch=x86_64
compiler=gcc

# Adjust to the gcc version of your MinGW package
compiler.version=7.3
compiler.libcxx=libstdc++11
build_type=Release
```

- Clone an example recipe or use your own recipe:

```
git clone https://github.com/memsharded/conan-hello.git
```

- Call **`conan create`** using the created **linux_to_win64**

```
$ cd conan-hello && conan create . conan/testing --profile ../linux_to_win64
...
[ 50%] Building CXX object CMakeFiles/example.dir/example.cpp.obj
[100%] Linking CXX executable bin/example.exe
[100%] Built target example
```

A *bin/example.exe* for Win64 platform has been built.

### Windows to Raspberry PI (Linux/ARM)

- Install the toolchain: http://gnutoolchains.com/raspberry/ You can choose different versions of the GCC cross compiler, choose one and adjust the following settings in the profile accordingly.
- Create a file named **win_to_rpi** with the contents:

```
target_host=arm-linux-gnueabihf
standalone_toolchain=C:/sysgcc/raspberry
cc_compiler=gcc
cxx_compiler=g++
```

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```
[settings]
os_build=Windows
arch_build=x86_64
os=Linux
arch=armv7 # Change to armv6 if you are using Raspberry 1
compiler=gcc
compiler.version=6
compiler.libcxx=libstdc++11
build_type=Release

[env]
CONAN_CMAKE_FIND_ROOT_PATH=$standalone_toolchain/$target_host/sysroot
PATH=[$standalone_toolchain/bin]
CHOST=$target_host
AR=$target_host-ar
AS=$target_host-as
RANLIB=$target_host-ranlib
LD=$target_host-ld
STRIP=$target_host-strip
CC=$target_host-$cc_compiler
CXX=$target_host-$cxx_compiler
CXXFLAGS=-I"$standalone_toolchain/$target_host/lib/include"
```

The profiles to target Linux are all very similar, probably you just need to adjust the variables declared in the top of the profile:

- **target_host**: All the executables in the toolchain starts with this prefix.
- **standalone_toolchain**: Path to the toolchain installation.
- **cc_compiler/cxx_compiler**: In this case `gcc`/`g++`, but could be `clang`/`clang++`.
- Clone an example recipe or use your own recipe:

```
git clone https://github.com/memsharded/conan-hello.git
```

- Call **`conan create`** using the created profile.

```
$ cd conan-hello && conan create . conan/testing --profile=../win_to_rpi
...
[ 50%] Building CXX object CMakeFiles/example.dir/example.cpp.obj
[100%] Linking CXX executable bin/example
[100%] Built target example
```

A *bin/example* for Raspberry PI (Linux/armv7hf) platform has been built.

### Linux/Windows/macOS to Android

Cross building a library for Android is very similar to the previous examples, except the complexity of managing different architectures (armeabi, armeabi-v7a, x86, arm64-v8a) and the Android API levels.

Download the Android NDK here and unzip it.

**Note:** If you are in Windows the process will be almost the same, but unzip the file in the root folder of your hard disk (`C:\`) to avoid issues with path lengths.

Now you have to build a standalone toolchain, we are going to target "arm" architecture and the Android API level 21, change the `--install-dir` to any other place that works for you:

```
$ cd build/tools
$ python make_standalone_toolchain.py --arch=arm --api=21 --stl=libc++ --install-dir=/
↪myfolder/arm_21_toolchain
```

**Note:** You can generate the standalone toolchain with several different options to target different architectures, api levels etc.

Check the Android docs: standalone toolchain

To use the `clang` compiler, create a profile `android_21_arm_clang`. Once again, the profile is very similar to the RPI one:

```
standalone_toolchain=/myfolder/arm_21_toolchain # Adjust this path
target_host=arm-linux-androideabi
cc_compiler=clang
cxx_compiler=clang++

[settings]
compiler=clang
compiler.version=5.0
compiler.libcxx=libc++
os=Android
os.api_level=21
arch=armv7
build_type=Release

[env]
CONAN_CMAKE_FIND_ROOT_PATH=$standalone_toolchain/sysroot
PATH=[$standalone_toolchain/bin]
CHOST=$target_host
AR=$target_host-ar
AS=$target_host-as
RANLIB=$target_host-ranlib
CC=$target_host-$cc_compiler
CXX=$target_host-$cxx_compiler
LD=$target_host-ld
STRIP=$target_host-strip
CFLAGS= -fPIE -fPIC -I$standalone_toolchain/include/c++/4.9.x
CXXFLAGS= -fPIE -fPIC -I$standalone_toolchain/include/c++/4.9.x
LDFLAGS= -pie
```

You could also use `gcc` using this profile `arm_21_toolchain_gcc`, changing the `cc_compiler` and `cxx_compiler` variables, removing `-fPIE` flag and, of course, changing the `[settings]` to match the gcc toolchain compiler:

```
standalone_toolchain=/myfolder/arm_21_toolchain
target_host=arm-linux-androideabi
cc_compiler=gcc
cxx_compiler=g++

[settings]
compiler=gcc
compiler.version=4.9
```

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```
compiler.libcxx=libstdc++
os=Android
os.api_level=21
arch=armv7
build_type=Release

[env]
CONAN_CMAKE_FIND_ROOT_PATH=$standalone_toolchain/sysroot
PATH=[$standalone_toolchain/bin]
CHOST=$target_host
AR=$target_host-ar
AS=$target_host-as
RANLIB=$target_host-ranlib
CC=$target_host-$cc_compiler
CXX=$target_host-$cxx_compiler
LD=$target_host-ld
STRIP=$target_host-strip
CFLAGS= -fPIC -I$standalone_toolchain/include/c++/4.9.x
CXXFLAGS= -fPIC -I$standalone_toolchain/include/c++/4.9.x
LDFLAGS=
```

- Clone, for example, the zlib library to try to build it to Android

```
git clone https://github.com/conan-community/conan-zlib.git
```

- Call **conan create** using the created profile.

```
$ cd conan-zlib && conan create . conan/testing --profile=../android_21_arm_clang

...
-- Build files have been written to: /tmp/conan-zlib/test_package/build/
↪ba0b9dbae0576b9a23ce7005180b00e4fdef1198
Scanning dependencies of target enough
[ 50%] Building C object CMakeFiles/enough.dir/enough.c.o
[100%] Linking C executable bin/enough
[100%] Built target enough
zlib/1.2.11@conan/testing (test package): Running test()
```

A **bin/enough** for Android ARM platform has been built.

### Using build requires

Instead of downloading manually the toolchain and creating a profile, you can create a Conan package with it. The toolchain Conan package needs to fill the `env_info` object in the *package_info()* method with the same variables we've specified in the examples above in the `[env]` section of profiles.

A layout of a Conan package for a toolchain could looks like this:

```
from conans import ConanFile
import os


class MyToolchainXXXConan(ConanFile):
    name = "my_toolchain"
    version = "0.1"
    settings = "os_build", "arch_build"
```

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```
    def build(self):
        # Typically download the toolchain for the 'build' host
        url = "http://fake_url.com/installers/%s/%s/toolchain.tgz" % (os_build, os_
↪arch)
        tools.download(url, "toolchain.tgz")
        tools.unzip("toolchain.tgz")

    def package(self):
        # Copy all the
        self.copy("*", dst="", src="toolchain")

    def package_info(self):
        bin_folder = os.path.join(self.package_folder, "bin")
        self.env_info.path.append(bin_folder)
        self.env_info.CC = os.path.join(bin_folder, "mycompiler-cc")
        self.env_info.CXX = os.path.join(bin_folder, "mycompiler-cxx")
        self.env_info.SYSROOT = self.package_folder
```

Finally, when you want to cross-build a library, the profile to be used, will include a `[build_requires]` section with the reference to our new packaged toolchain. Also will contain a `[settings]` section with the same settings of the examples above.

### Example: Darwin Toolchain

Check the Darwin Toolchain package in conan-center. You can use a profile like the following to cross build your packages for `iOS`, `watchOS` and `tvOS`:

Listing 1: ios_profile

```
include(default)

[settings]
os=iOS
os.version=9.0
arch=armv7

[build_requires]
darwin-toolchain/1.0@theodelrieu/stable
```

```
$ conan install . --profile ios_profile
```

**See also:**

- Check the *Creating conan packages to install dev tools* to learn more about how to create Conan packages for tools.
- Check the mingw-installer build require recipe as an example of packaging a compiler.

### Using Docker images

You can use some *available docker images with Conan preinstalled images* to cross build conan packages. Currently there are `i386`, `armv7` and `armv7hf` images with the needed packages and toolchains installed to cross build.

**Example**: Cross-building and uploading a package along with all its missing dependencies for `Linux/armv7hf` is done in few steps:

```
$ git clone https://github.com/conan-community/conan-openssl
$ cd conan-openssl
$ docker run -it -v$(pwd):/home/conan/project --rm conanio/gcc49-armv7hf /bin/bash

# Now we are running on the conangcc49-armv7hf container
$ sudo pip install conan --upgrade
$ cd project

$ conan create . user/channel --build missing
$ conan remote add myremoteARMV7 http://some.remote.url
$ conan upload "*" -r myremoteARMV7 --all
```

Check the section: *How to run Conan with Docker* to know more.

#### Preparing recipes to be cross-compiled

If you use the build helpers *AutoToolsBuildEnvironment* or *CMake*, Conan will adjust the configuration accordingly to the specified settings.

If don't, you can always check the `self.settings.os`, `self.settings.build_os`, `self.settings.arch` and `self.settings.build_arch` settings values and inject the needed flags to your build system script.

You can use this tool to check if you are cross building:

- *tools.cross_building(self.settings)* (returns True or False)

### 10.1.4 ARM architecture reference

Remember that the conan settings are intended to unify the different names for operating systems, compilers, architectures etc.

Conan has different architecture settings for ARM: `armv6`, `armv7`, `armv7hf`, `armv8`. The "problem" with ARM architecture is that frequently are named in different ways, so maybe you are wondering what setting do you need to specify in your case.

Here is a table with some typical ARM platforms:

| Platform | Conan setting |
|---|---|
| Raspberry PI 1 | `armv6` |
| Raspberry PI 2 | `armv7` or `armv7hf` if we want to use the float point hard support |
| Raspberry PI 3 | `armv8` also known as armv64-v8a |
| Visual Studio | `armv7` currently Visual Studio builds `armv7` binaries when you select ARM. |
| Android armbeabi-v7a | `armv7` |
| Android armv64-v8a | `armv8` |
| Android armeabi | `armv6` (as a minimal compatible, will be compatible with v7 too) |

**See also:**

Reference links

**ARM**

- https://developer.arm.com/docs/dui0773/latest/compiling-c-and-c-code/specifying-a-target-architecture-processor-and-instructio

- https://developer.arm.com/docs/dui0774/latest/compiler-command-line-options/-target
- https://developer.arm.com/docs/dui0774/latest/compiler-command-line-options/-march

**ANDROID**

- https://developer.android.com/ndk/guides/standalone_toolchain

**VISUAL STUDIO**

- https://msdn.microsoft.com/en-us/library/dn736986.aspx

**See also:**

- See *conan.conf file* and *Environment variables* sections to know more.
- See *AutoToolsBuildEnvironment build helper* reference.
- See *CMake build helper* reference.
- See CMake cross building wiki to know more about cross building with CMake.

## 10.2 Windows Subsystems

On Windows, you can run different *subsystems* that enhance with UNIX capabilities the operating system.

Conan supports `MSYS2`, `CYGWIN`, `WSL` and in general any subsystem that is able to run a `bash` terminal.

Many libraries use these subsystems to be able to use the Unix tools like the `Autoconf` suite to generate and build `Makefiles`.

The difference between MSYS2 and CYGWIN is that MSYS2 is oriented to the development of native Windows packages, while CYGWIN tries to provide a complete unix-like system to run any Unix application on it.

For that reason, we recommend the use of MSYS2 as a subsystem to be used with Conan.

### 10.2.1 Operation Modes

The `MSYS2` and `CYGWIN` can be used with different operation modes:

- You can use them together with MinGW to build Windows-native software.
- You can use them together with any other compiler to build Windows-native software, even with Visual Studio.
- You can use them with MinGW to build specific software for the subsystem, with a dependency to a runtime DLL (`msys-2.0.dll` and `cygwin1.dll`)

If you are building specific software for the subsystem, you have to specify a value for the setting `os.subsystem`, if you are only using the subsystem for taking benefit of the UNIX tools but generating native Windows software, you shouldn't specify it.

### 10.2.2 Running commands inside the subsystem

#### self.run()

In a Conan recipe, you can use the `self.run` method specifying the parameter `win_bash=True` that will call automatically to the tool *tools.run_in_windows_bash*.

It will use the **bash** in the path or the **bash** specified for the environment variable *CONAN_BASH_PATH* to run the specified command.

Conan will automatically escape the command to match the detected subsystem. If you also specify the `msys_mingw` parameter to False, and the subsystem is `MSYS2` it will run in Windows-native mode, the compiler won't link against the `msys-2.0.dll`.

#### AutoToolsBuildEnvironment

In the constructor of the build helper, you have the `win_bash` parameter. Set it to `True` to run the `configure` and `make` commands inside a bash.

### 10.2.3 Controlling the build environment

Building software in a Windows subsystem for a different compiler than MinGW can be painful sometimes. The reason is how the subsystem finds your compiler/tools in your system.

For example, the icu library requires Visual Studio to be built in Windows, but also a subsystem able to build the Makefile. A very common problem and example of the pain is the `link.exe` program. In the Visual Studio suite, `link.exe` is the linker, but in the `MSYS2` environment the `link.exe` is a tool to manage symbolic links.

Conan is able to prioritize the tools when you use `build_requires`, and put the tools in the PATH in the right order.

There are some packages you can use as `build_requires`:

- From Conan-center:
  - **mingw_installer/1.0@conan/stable**: MinGW compiler installer as a Conan package.
  - **msys2_installer/latest@bincrafters/stable**: MSYS2 subsystem as a Conan package.
  - **cygwin_installer/2.9.0@bincrafters/stable**: Cygwin subsystem as a Conan package.

For example, create a profile and name it *msys2_mingw* with the following contents:

```
[build_requires]
mingw_installer/1.0@conan/stable
msys2_installer/latest@bincrafters/stable

[settings]
os_build=Windows
os=Windows
arch=x86_64
arch_build=x86_64
compiler=gcc
compiler.version=4.9
compiler.exception=seh
compiler.libcxx=libstdc++11
compiler.threads=posix
build_type=Release
```

Then you can have a *conanfile.py* that can use `self.run()` with `win_bash=True` to run any command in a bash terminal or use the `AutoToolsBuildEnvironment` to invoke `configure/make` in the `subsystem`:

```
from conans import ConanFile
import os


class MyToolchainXXXConan(ConanFile):
    name = "mylib"
```

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```
    version = "0.1"
    ...

    def build(self):
        self.run("some_command", win_bash=True)

        env_build = AutoToolsBuildEnvironment(self, win_bash=True)
        env_build.configure()
        env_build.make()

     ...
```

And apply the profile in your recipe to create a package using the MSYS2 and MINGW:

```
$ conan create . user/testing --profile msys2_mingw
```

As we included in the profile the `MinGW` and then the `MSYS2` build_require, when we run a command, the PATH will contain first the MinGW tools and finally the MSYS2.

What could we do with the Visual Studio issue with `link.exe`? You can pass an additional parameter to `run_in_windows_bash` with a dictionary of environment variables to have more priority than the others:

```
def build(self):
    # ...
    vs_path = tools.vcvars_dict(self.settings)["PATH"] # Extract the path from the␣
↪vcvars_dict tool
    tools.run_in_windows_bash(self, command, env={"PATH": vs_path})
```

So you will get first the `link.exe` from the Visual Studio.

Also, Conan has a tool `tools.remove_from_path` that you can use in a recipe to remove temporally a tool from the path if you know that it can interfere with your build script:

```
class MyToolchainXXXConan(ConanFile):
    name = "mylib"
    version = "0.1"
    ...

    def build(self):
        with tools.remove_from_path("link"):
            # Call something
            self.run("some_command", win_bash=True)

     ...
```

CHAPTER

ELEVEN

# EXTENDING CONAN

This section provides an introduction to extension capabilities of Conan:

## 11.1 Python requires: reusing python code in recipes [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The `python_requires()` feature allows to extend the recipes reusing Python code from other **conanfile.py** easily, even for inheritance approaches. The code to be reused will be in a *conanfile.py* recipe, and will be managed as any other Conan package.

Let's create for example some reusable base class:

```
from conans import ConanFile

class MyBase(ConanFile):
    def source(self):
        self.output.info("My cool source!")
    def build(self):
        self.output.info("My cool build!")
    def package(self):
        self.output.info("My cool package!")
    def package_info(self):
        self.output.info("My cool package_info!")
```

With this conanfile, we can export it to the local cache to make it available, and also upload to our remote:

```
$ conan export . MyBase/0.1@user/channel
$ conan upload MyBase/0.1@user/channel -r=myremote
```

It is not necessary to "create" any package binaries, or to `upload --all`, because there are no binaries for this recipe.

Now, using the `python_requires()` we can write a new package recipe like:

```
from conans import python_requires

base = python_requires("MyBase/0.1@user/channel")
```

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```
class PkgTest(base.MyBase):
    pass
```

If we run a `conan create`, of this recipe, we can see how it is effectively reusing the above code:

```
$ conan create . Pkg/0.1@user/channel

Pkg/0.1@lasote/testing: Installing package
Requirements
    Pkg/0.1@lasote/testing from local cache - Cache
Python requires
    MyConanfileBase/1.1@lasote/testing
Packages
    Pkg/0.1@lasote/testing:5ab84d6acfe1f23c4fae0ab88f26e3a396351ac9 - Build
...
Pkg/0.1@lasote/testing: Configuring sources
Pkg/0.1@lasote/testing: My cool source!
...
Pkg/0.1@lasote/testing: Calling build()
Pkg/0.1@lasote/testing: My cool build!
...
Pkg/0.1@lasote/testing: Calling package()
Pkg/0.1@lasote/testing: My cool package!
...
Pkg/0.1@lasote/testing: My cool package_info!
```

It is not compulsory to extend the reused `MyBase` class, it is possible to reuse just functions too:

```
from conans import ConanFile

def my_build(settings):
    # doing custom stuff based on settings

class MyBase(ConanFile):
    pass
```

```
$ conan export . MyBuild/0.1@user/channel
$ conan upload MyBuild/0.1@user/channel -r=myremote
```

```
from conans import ConanFile, python_requires

base = python_requires("MyBuild/0.1@user/channel")

class PkgTest(ConanFile):
    ...
    def build(self):
        base.my_build(self.settings)
```

Version ranges are possible with the version ranges notation `[]`, similar to regular requirements. Multiple `python_requires()` are also possible

Listing 1: **conanfile.py**

```
from conans import python_requires

base = python_requires("MyBase/[~0.1]@user/channel")
```

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```
other = python_requires("Other/1.2@user/channel")

class Pkg(base.MyBase):
    def source(self):
        other.some_function()
```

It is possible to structure the code in different files too:

Listing 2: **conanfile.py**

```
from conans import ConanFile
import mydata # reuse the strings from here
class MyConanfileBase(ConanFile):
    exports = "*.py"
    def source(self):
        self.output.info(mydata.src)
```

Listing 3: **mydata.py**

```
src = "My cool source!"
build = "My cool build!"
pkg = "My cool package!"
info = "My cool package_info!"
```

This would be created with the same `conan export` and consumed with the same `base = python_requires("MyBase/0.1@user/channel")` as above.

There are a few important considerations regarding `python_requires()`:

- They are required at every step of the conan commands. If you are creating a package that `python_requires("MyBase/...")`, the `MyBase` package should be already available in the local cache or to be downloaded from the remotes. Otherwise, conan will raise a "missing package" error.
- They do not affect the package binary ID (hash). Depending on different version, or different channel of such `python_requires()` do not change the package IDs as the normal dependencies do.
- They are imported only once. The python code that is reused is imported only once, the first time it is required. Subsequent requirements of that conan recipe will reuse the previously imported module. Global initialization at parsing time and global state are discouraged.
- They are transitive. One recipe using `python_requires()` can be also consumed with a `python_requires()` from another package recipe.
- They are not automatically updated with the `--update` argument from remotes.
- Different packages can require different versions in their `python_requires()`. They are private to each recipe, so they do not conflict with each other, but it is the responsibility of the user to keep consistency.
- They are not overridden from downstream consumers. Again, as they are private, they are not affected by other packages, even consumers

## 11.2 Hooks [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The Conan hooks is a feature intended to extend the Conan functionalities and let users customize the client behavior at determined points.

### 11.2.1 Hook structure

Hooks are Python files containing **pre** and **post** functions that will be executed prior and after a determined task performed by the Conan client. Those tasks could be Conan commands, recipe interactions such as exporting or packaging or interactions with the remotes.

Here you can see an example of a simple hook:

Listing 4: *example_hook.py*

```
from conans import tools


def pre_export(output, conanfile, conanfile_path, reference, **kwargs):
    test = "%s/%s" % (reference.name, reference.version)
    for field in ["url", "license", "description"]:
        field_value = getattr(conanfile, field, None)
        if not field_value:
            output.error("%s Conanfile doesn't have '%s'. It is recommended to add␣
↪it as attribute: %s"
                         % (test, field, conanfile_path))

def pre_source(output, conanfile, conanfile_path, **kwargs):
    conanfile_content = tools.load(conanfile_path)
    if "def source(self):" in conanfile_content:
        test = "[IMMUTABLE SOURCES]"
        valid_content = [".zip", ".tar", ".tgz", ".tbz2", ".txz"]
        invalid_content = ["git checkout master", "git checkout devel", "git␣
↪checkout develop"]
        if "git clone" in conanfile_content and "git checkout" in conanfile_content:
            fixed_sources = True
            for invalid in invalid_content:
                if invalid in conanfile_content:
                    fixed_sources = False
        else:
            fixed_sources = False
            for valid in valid_content:
                if valid in conanfile_content:
                    fixed_sources = True

        if not fixed_sources:
            output.error("%s Source files does not come from and immutable place.␣
↪Checkout to a "
                         "commit/tag or download a compressed source file for %s" %␣
↪(test, str(reference)))
```

This hook is only checking the recipe content prior to the recipe being exported and prior to downloading the sources. Basically the `pre_export()` function is checking the attributes of the `conanfile` object to see if there is an URL, a license and a description and warning the user with a message through the `output`. This is done **before** the recipe is exported to the local cache.

The `pre_source()` function checks if the recipe contains a `source()` method (this time it is using the conanfile content instead of the `conanfile` object) and in that case it checks if the download of the sources are likely coming from immutable places (a compressed file or a determined **`git checkout`**). This is done **before** the **source()** method

of the recipe is called.

Any kind of Python scripting can be executed. You can create global functions and call them from different hook functions, import from a relative module and warn, error or even raise to abort the Conan client execution.

As you can see each function receives some parameters but not all of them are available for all functions as this may change depending on the context of the commands being executed such as the recipe being in the local cache or not.

---

**Important:** A detailed description of the functions allowed and its parameters as well as their execution can be found in it dedicated reference section: *Hooks [EXPERIMENTAL]*.

---

Other useful task where a hook may come handy are the upload and download actions. There are **pre** and **post** functions for every download/upload as a whole and for fine download tasks such as recipe and package downloads/uploads.

For example they can be used to sign the packages (including a file with the signature) when the package is created and and checking that signature every time they are downloaded.

Listing 5: *signing_hook.py*

```
import os
from conans import tools

SIGNATURE = "this is my signature"

def post_package(output, conanfile, conanfile_path, **kwargs):
    sign_path = os.path.join(conanfile.package_folder, ".sign")
    tools.save(sign_path, SIGNATURE)
    output.success("Package signed successfully")

def post_download_package(output, conanfile_path, reference, package_id, remote_name,
↪ **kwargs):
    package_path = os.path.abspath(os.path.join(os.path.dirname(conanfile_path), ".."
↪", "package", package_id))
    sign_path = os.path.join(package_path, ".sign")
    content = tools.load(sign_path)
    if content != SIGNATURE:
        raise Exception("Wrong signature")
```

### 11.2.2 Importing from a module

The hook interface should always be placed inside a Python file with the name of the hook and stored in the *hooks* folder. However, you can use functionalities from imported modules if you have them installed in your system or if they are installed with Conan:

Listing 6: example_hook.py

```
import requests
from conans import tools

def post_export(output, conanfile, conanfile_path, reference, **kwargs):
    cmakelists_path = os.path.join(os.path.dirname(conanfile_path), "CMakeLists.txt")
    tools.replace_in_file(cmakelists_path, "PROJECT(MyProject)", "PROJECT(MyProject␣
↪CPP)")
    r = requests.get('https://api.github.com/events')
```

You can also import functionalities from a relative module:

```
hooks
├── custom_module
│   ├── custom.py
│   └── __init__.py
└── my_hook.py
```

Inside the *custom.py* from my *custom_module* there is:

```
def my_printer(output):
    output.info("my_printer(): CUSTOM MODULE")
```

And it can be used in hook importing the module:

```
from custom_module.custom import my_printer


def pre_export(output, conanfile, conanfile_path, reference, **kwargs):
    my_printer(output)
```

### 11.2.3 Storage, activation and sharing

Hooks are Python files stored under *~/.conan/hooks* folder and **their file name should be the same used for activation** (without the *.py* extension).

The activation of the hooks is done in the *conan.conf* section named `[hooks]`. The hook names listed under this section will be considered activated.

Listing 7: *conan.conf*

```
...
[hooks]
attribute_checker
conan-center
```

They can be easily activated and deactivated from the command line using the **`conan config set`** command:

```
$ conan config set hooks.attribute_checker  # Activates 'attribute_checker'

$ conan config rm hooks.attribute_checker  # Deactivates 'attribute_checker'
```

There is also an environment variable `CONAN_HOOKS` to list the active hooks. Hooks listed in *conan.conf* will be loaded into this variable and values in the environment variable will be used to load the hooks.

Hooks are considered part of the Conan client configuration and can be shared as usual with the *conan config install* command.

### 11.2.4 Official Hooks

There is a simple *attribute_checker* hook ready to be used in Conan. You can take it as a starting point to create your own ones.

### attribute_checker

This hook is shipped together with the Conan client and its functionality is warning when recipes do not contain some metadata attributes.

Listing 8: *attribute_checker.py*

```
def pre_export(output, conanfile, conanfile_path, reference, **kwargs):
    # Check basic meta-data
    for field in ["url", "license", "description"]:
        field_value = getattr(conanfile, field, None)
        if not field_value:
            output.warn("Conanfile doesn't have '%s'. It is recommended to add it as␣
↪attribute"
                        % field)
```

This hook comes activated by default.

CHAPTER

TWELVE

# INTEGRATIONS

This topical list of build systems, IDEs, and CI platforms provides information on how conan packages can be consumed, created, and continuously deployed/tested with each, as applicable.

## 12.1 CMake

Conan can be integrated with CMake using generators, build helpers and custom *findXXX.cmake* files:

### 12.1.1 `cmake` generator

If you are using **CMake** to build your project, you can use the `cmake` generator to define all your requirements information in cmake syntax. It creates a file named `conanbuildinfo.cmake` that can be imported from your `CMakeLists.txt`.

Listing 1: *conanfile.txt*

```
...
[generators]
cmake
```

When **`conan install`** is executed, a file named *conanbuildinfo.cmake* is created.

You can include *conanbuildinfo.cmake* in your project's *CMakeLists.txt* to manage our requirements. The inclusion of *conanbuildinfo.cmake* doesn't alter the CMake environment at all, it just provides `CONAN_` variables and some useful macros.

#### Global variables approach

The simplest way to consume it would be to invoke the `conan_basic_setup()` macro, which will basically set global include directories, libraries directories, definitions, etc. so typically is enough to do:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()
```

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```
add_executable(timer timer.cpp)
target_link_libraries(timer ${CONAN_LIBS})
```

The `conan_basic_setup()` is split in smaller macros, that should be self explanatory. If you need to do something different, you can just use them individually.

**Note:** This approach makes all dependencies visible to all CMake targets and may also increase the build times due to unneeded include and library path components. This is particularly relevant if you have multiple targets with different dependencies. In that case, you should consider using the *Targets approach*.

#### Targets approach

For **modern cmake (>=3.1.2)**, you can use the following approach:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup(TARGETS)

add_executable(timer timer.cpp)
target_link_libraries(timer CONAN_PKG::Poco)
```

Using `TARGETS` as argument, `conan_basic_setup()` will internally call the macro `conan_define_targets()` which defines cmake `INTERFACE IMPORTED` targets, one per package. These targets, named `CONAN_PKG::PackageName` can be used to link with, instead of using global cmake setup.

**See also:**

Check the *CMake generator* section to read more.

**Note:** The `CMAKE_MODULE_PATH` and `CMAKE_PREFIX_PATH` contain the paths to the `self.info.builddirs` of every required package. By default, the root package folder is the only one declared in `builddirs`. Check *cpp_info* for more information.

### 12.1.2 `cmake_multi` generator

`cmake_multi` generator is intended for CMake multi-configuration environments, like Visual Studio and Xcode IDEs that do not configure for a specific `build_type`, like Debug or Release, but rather can be used for both and switch among Debug and Release configurations with a combo box or similar control. The project configuration for cmake is different, in multi-configuration environments, the flow would be:

```
$ cmake .. -G "Visual Studio 14 Win64"
# Now open the IDE (.sln file) or
$ cmake --build . --config Release
```

While in single-configuration environments (Unix Makefiles, etc):

```
$ cmake .. -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release
# Build from your IDE, launching make, or
$ cmake --build .
```

The `CMAKE_BUILD_TYPE` default, if not specified is `Debug`.

With the regular conan `cmake` generator, only 1 configuration at a time can be managed. Then, it is a universal, homogeneous solution for all environments. This is the recommended way, using the regular `cmake` generator, and just go to the command line and switch among configurations:

```
$ conan install . -s build_type=Release ...
# Work in release, then, to switch to Debug dependencies
$ conan install . -s build_type=Debug ...
```

However, end consumers with heavy usage of the IDE, might want a multi-configuration build. The `cmake_multi` **experimental** generator is able to do that. First, both Debug and Release dependencies have to be installed:

```
$ conan install . -g cmake_multi -s build_type=Release ...
$ conan install . -g cmake_multi -s build_type=Debug  ...
```

These commands will generate 3 files: `conanbuildinfo_release.cmake`, `conanbuildinfo_debug.cmake`, and `conanbuildinfo_multi.cmake`, which includes the other two, and enables its use.

**Warning:** The `cmake_multi` generator is designed as a helper for consumers, but not for creating packages. If you also want to create a package, see *Creating packages* section.

### Global variables approach

The consumer project might write a `CMakeLists.txt` like:

```
project(MyHello)
cmake_minimum_required(VERSION 2.8.12)

include(${CMAKE_BINARY_DIR}/conanbuildinfo_multi.cmake)
conan_basic_setup()

add_executable(say_hello main.cpp)
foreach(_LIB ${CONAN_LIBS_RELEASE})
    target_link_libraries(say_hello optimized ${_LIB})
endforeach()
foreach(_LIB ${CONAN_LIBS_DEBUG})
    target_link_libraries(say_hello debug ${_LIB})
endforeach()
```

### Targets approach

Or, if using the modern cmake syntax with targets (where `Hello1` is an example package name that the executable `say_hello` depends on):

```
project(MyHello)
cmake_minimum_required(VERSION 2.8.12)

include(${CMAKE_BINARY_DIR}/conanbuildinfo_multi.cmake)
conan_basic_setup(TARGETS)

add_executable(say_hello main.cpp)
target_link_libraries(say_hello CONAN_PKG::Hello1)
```

There's also a convenient macro for linking to all libraries:

```
project(MyHello)
cmake_minimum_required(VERSION 2.8.12)

include(${CMAKE_BINARY_DIR}/conanbuildinfo_multi.cmake)
conan_basic_setup()

add_executable(say_hello main.cpp)
conan_target_link_libraries(say_hello)
```

With this approach, the end user can open the generated IDE project and switch among both configurations, building the project, or from the command line:

```
$ cmake --build . --config Release
# And without having to conan install again, or do anything else
$ cmake --build . --config Debug
```

#### Creating packages

The `cmake_multi` generator is just for consumption. It cannot be used to create packages. If you want to be able to both use the `cmake_multi` generator to install dependencies and build your project but also to create packages from that code, you need to specify the regular `cmake` generator for package creation, and prepare the *CMakeLists.txt* accordingly, something like:

```
project(MyHello)
cmake_minimum_required(VERSION 2.8.12)

if(EXISTS ${CMAKE_BINARY_DIR}/conanbuildinfo_multi.cmake)
    include(${CMAKE_BINARY_DIR}/conanbuildinfo_multi.cmake)
else()
    include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
endif()

conan_basic_setup()

add_executable(say_hello main.cpp)
conan_target_link_libraries(say_hello)
```

Then, make sure that the generator `cmake_multi` is **not** specified in the conanfiles, but the users specify it in the command line while installing dependencies:

```
$ conan install . -g cmake_multi
```

**See also:**

Check the section *Reference/Generators/cmake* to read more about this generator.

### 12.1.3 `cmake_paths` generator

This generator is especially useful if you are using `CMake` based only on the `find_package` feature to locate the dependencies.

The `cmake_paths` generator creates a file named `conan_paths.cmake` declaring:

- `CMAKE_MODULE_PATH` with the folders of the required packages, to allow CMake to locate the included cmake scripts and `FindXXX.cmake` files. The folder containing the *conan_paths.cmake* (*self.install_folder*

when used in a recipe) is also included, so any custom file will be located too. Check *cmake_find_package generator* generator.

- `CMAKE_PREFIX_PATH` used by `find_library()` to locate library files (*.a*, *.lib*, *.so*, *.dll*) in your packages.

Listing 2: conanfile.txt

```
[requires]
zlib/1.2.11@conan/stable
...

[generators]
cmake_paths
```

Listing 3: CMakeList.txt

```
cmake_minimum_required(VERSION 3.0)
project(helloworld)
add_executable(helloworld hello.c)
find_package(Zlib)
if(ZLIB_FOUND)
   include_directories(${ZLIB_INCLUDE_DIRS})
   target_link_libraries (helloworld ${ZLIB_LIBRARIES})
endif()
```

In the example above, the `zlib/1.2.11@conan/stable` package is not packaging a custom `FindZLIB.cmake` file, but the `FindZLIB.cmake` included in the CMake installation directory (*/Modules*) will locate the zlib library from the Conan package because of the `CMAKE_PREFIX_PATH` used by the `find_library()`.

If the `zlib/1.2.11@conan/stable` would had included a custom `FindZLIB.cmake` in the package root folder or any declared *self.cpp_info.builddirs*, it would have been located because of the `CMAKE_MODULE_PATH` variable.

### Included as a toolchain

You can use the *conan_paths.cmake* as a toolchain without modifying your *CMakeLists.txt* file:

```
$ mkdir build && cd build
$ conan install ..
$ cmake .. -DCMAKE_TOOLCHAIN_FILE=conan_paths.cmake -G "Unix Makefiles" -DCMAKE_
↪BUILD_TYPE=Release
$ cmake --build .
```

### Included using the `CMAKE_PROJECT_<PROJECT-NAME>_INCLUDE`

With `CMAKE_PROJECT_<PROJECT-NAME>_INCLUDE` you can specify a file to be included by the `project()` command. If you already have a toolchain file you can use this variable to include the `conan_paths.cmake` and insert your toolchain with the `CMAKE_TOOLCHAIN_FILE`.

```
$ mkdir build && cd build
$ conan install ..
$ cmake .. -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release -DCMAKE_PROJECT_helloworld_
↪INCLUDE=build/conan_paths.cmake
$ cmake --build .
```

#### Included in your *CMakeLists.txt*

Listing 4: CMakeList.txt

```
cmake_minimum_required(VERSION 3.0)
project(helloworld)

include(${CMAKE_BINARY_DIR}/conan_paths.cmake)

add_executable(helloworld hello.c)

find_package(zlib)

if(ZLIB_FOUND)
   include_directories(${ZLIB_INCLUDE_DIRS})
   target_link_libraries (helloworld ${ZLIB_LIBRARIES})
endif()
```

```
$ mkdir build && cd build
$ conan install ..
$ cmake .. -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release
$ cmake --build .
```

**See also:**

Check the section *cmake_paths* to read more about this generator.

---

**Note:** The `CMAKE_MODULE_PATH` and `CMAKE_PREFIX_PATH` contain the paths to the `builddirs` of every required package. By default the root package folder is the only declared `builddirs` directory. Check *cpp_info*.

---

### 12.1.4 `cmake_find_package` generator

This generator is especially useful if you are using `CMake` using the `find_package` feature to locate the dependencies.

The `cmake_find_package` generator creates a file for each requirement specified in a conanfile.

The name of the files follows the pattern `Find<package_name>.cmake`. So for the `zlib/1.2.11@conan/stable` package, a `Findzlib.cmake` file will be generated.

#### In a conanfile.py

Listing 5: conanfile.py

```
from conans import ConanFile, tools


class LibConan(ConanFile):
    ...
    requires = "zlib/1.2.11@conan/stable"
    generators = "cmake_find_package"

    def build(self):
```

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```
        cmake = CMake(self) # it will find the packages by using our auto-generated␣
↪FindXXX.cmake files
        cmake.configure()
        cmake.build()
```

In the previous example, the `CMake` build helper will adjust automatically the `CMAKE_MODULE_PATH` to the `conanfile.install_folder`, where the generated `Find<package_name>.cmake` is.

In the `CMakeList.txt` you do not need to specify or include anything related with Conan at all, just rely on the `find_package` feature:

Listing 6: CMakeList.txt

```
cmake_minimum_required(VERSION 3.0)
project(helloworld)
add_executable(helloworld hello.c)
find_package(zlib)

# Global approach
if(zlib_FOUND)
   include_directories(${zlib_INCLUDE_DIRS})
   target_link_libraries (helloworld ${zlib_LIBRARIES})
endif()

# Modern CMake targets approach
if(TARGET zlib::zlib)
   target_link_libraries(helloworld zlib::zlib)
endif()
```

```
$ conan create . user/channel

lib/1.0@user/channel: Calling build()
-- The C compiler identification is AppleClang 9.1.0.9020039
...
-- Conan: Using autogenerated Findzlib.cmake
-- Found: /Users/user/.conan/data/zlib/1.2.11/conan/stable/package/
↪0eaf3bfbc94fb6d2c8f230d052d75c6c1a57a4ce/lib/libz.a
lib/1.0@user/channel: Package '72bce3af445a371b892525bc8701d96c568ead8b' created
```

### In a *conanfile.txt*

If you are using a `conanfile.txt` file in your project, instead of a `conanfile.py`, this generator can be used together with the *cmake_paths* generator to adjust the `CMAKE_MODULE_PATH` variable automatically and let CMake locate the generated `Find<package_name>.cmake` files.

With `cmake_paths`:

Listing 7: conanfile.txt

```
[requires]
zlib/1.2.11@conan/stable
...

[generators]
```

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```
cmake_find_package
cmake_paths
```

Listing 8: CMakeList.txt

```
cmake_minimum_required(VERSION 3.0)
project(helloworld)
include(${CMAKE_BINARY_DIR}/conan_paths.cmake)
add_executable(helloworld hello.c)
find_package(zlib)

# Global approach
if(zlib_FOUND)
   include_directories(${zlib_INCLUDE_DIRS})
   target_link_libraries (helloworld ${zlib_LIBRARIES})
endif()

# Modern CMake targets approach
if(TARGET zlib::zlib)
   target_link_libraries(helloworld zlib::zlib)
endif()
```

```
$ mkdir build && cd build
$ conan install ..
$ cmake .. -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release
  -- Conan: Using autogenerated Findzlib.cmake
  -- Found: /Users/user/.conan/data/zlib/1.2.11/conan/stable/package/
↪0eaf3bfbc94fb6d2c8f230d052d75c6c1a57a4ce/lib/libz.a
  ...

$ cmake --build .
```

Or you can also adjust `CMAKE_MODULE_PATH` manually.

Without **cmake_paths**, adjusting `CMAKE_MODULE_PATH` manually:

Listing 9: conanfile.txt

```
[requires]
zlib/1.2.11@conan/stable
...

[generators]
cmake_find_package
```

Listing 10: CMakeList.txt

```
cmake_minimum_required(VERSION 3.0)
project(helloworld)
set(CMAKE_MODULE_PATH ${CMAKE_BINARY_DIR} ${CMAKE_MODULE_PATH})
add_executable(helloworld hello.c)
find_package(zlib)

# Global approach
if(zlib_FOUND)
   include_directories(${zlib_INCLUDE_DIRS})
```

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```
    target_link_libraries (helloworld ${zlib_LIBRARIES})
endif()

# Modern CMake targets approach
if(TARGET zlib::zlib)
    target_link_libraries(helloworld zlib::zlib)
endif()
```

**See also:**

Check the section *cmake_find_package* to read more about this generator and the adjusted CMake variables/targets.

### 12.1.5 Build automation

You can invoke CMake from your conanfile.py file and automate the build of your library/project. Conan provides a `CMake()` helper. This helper is useful to call `cmake` command both for creating conan packages or automating your project build with the **`conan build .`** command. The `CMake()` helper will take into account your settings to automatically set definitions and a generator according to your compiler, build_type, etc.

**See also:**

Check the section *Building with CMake*.

### 12.1.6 Find Packages

If a FindXXX.cmake file for the library you are packaging is already available, it should work automatically.

Variables **CMAKE_INCLUDE_PATH** and **CMAKE_LIBRARY_PATH** are set with the right requirements paths. CMake **find_library** function will be able to locate the libraries in the package's folders.

So, you can use **find_package** normally:

```
project(MyHello)
cmake_minimum_required(VERSION 2.8.12)

include(conanbuildinfo.cmake)
conan_basic_setup()

find_package("ZLIB")

if(ZLIB_FOUND)
    add_executable(enough enough.c)
    include_directories(${ZLIB_INCLUDE_DIRS})
    target_link_libraries(enough ${ZLIB_LIBRARIES})
else()
    message(FATAL_ERROR "Zlib not found")
endif()
```

In addition to automatic **find_package** support, **CMAKE_MODULE_PATH** variable is set with your requirements root package paths. You can override the default behavior of any find_package() by creating a `findXXX.cmake` file in your package.

### Creating a custom FindXXX.cmake file

Sometimes the "official" CMake FindXXX.cmake scripts are not ready to find our libraries (not supported library names for specific settings, fixed installation directories like `C:\OpenSSL`, etc.) Or maybe there is no "official" CMake script for our library.

So in these cases we can provide a custom **FindXXX.cmake** file in our conan packages.

1. Create a file named FindXXX.cmake and save it in your conan package root folder. Where XXX is the name of the library that we will use in the **find_package** CMake function. For example, we create a `FindZLIB.cmake` and use `find_package(ZLIB)`. We recommend to copy the original FindXXX.cmake file from Kitware (folder Modules/FindXXX.cmake), if available, and modify it to help finding our library files, but it depends a lot, maybe you are interested in creating a new one.

If it's not provided you can create a basic one, take a look at this example with the ZLIB library:

**FindZLIB.cmake**

```
find_path(ZLIB_INCLUDE_DIR NAMES zlib.h PATHS ${CONAN_INCLUDE_DIRS_ZLIB})
find_library(ZLIB_LIBRARY NAMES ${CONAN_LIBS_ZLIB} PATHS ${CONAN_LIB_DIRS_ZLIB})

set(ZLIB_FOUND TRUE)
set(ZLIB_INCLUDE_DIRS ${ZLIB_INCLUDE_DIR})
set(ZLIB_LIBRARIES ${ZLIB_LIBRARY})
mark_as_advanced(ZLIB_LIBRARY ZLIB_INCLUDE_DIR)
```

In the first line we are finding the path where our headers should be found, we suggest the CONAN_INCLUDE_DIRS_XXX. Then the same for the library names with CONAN_LIBS_XXX and the paths where the libs are CONAN_LIB_DIRS_XXX.

2. In your conanfile.py file add the `FindXXX.cmake` to the `exports_sources` field:

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    ...
    exports_sources = ["FindXXX.cmake"]
```

3. In the package method, copy the `FindXXX.cmake` file to the root:

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    ...
    exports_sources = ["FindXXX.cmake"]


    def package(self):
        ...
        self.copy("FindXXX.cmake", ".", ".")
```

## 12.2 Autotools: configure/make

If you are using **configure/make** you can use **AutoToolsBuildEnvironment** helper. This helper sets `LIBS`, `LDFLAGS`, `CFLAGS`, `CXXFLAGS` and `CPPFLAGS` environment variables based on your requirements.

Check *Building with Autotools* for more info.

## 12.3 Visual Studio

Conan can be integrated with **Visual Studio** in two different ways:

- Using the **cmake** generator to create a **conanbuildinfo.cmake** file.
- Using the **visual_studio** generator to create a **conanbuildinfo.props** file.

### 12.3.1 With CMake

Use the **cmake** generator, or **cmake_multi**, if you are using cmake to machine-generate your Visual Studio projects.

Check the *generator* section to read about the **cmake** generator. Check the official CMake docs to find out more about generating Visual Studio projects with CMake.

However, beware of some current cmake limitations, such as not dealing well with find-packages, because cmake doesn't know how to handle finding both debug and release packages.

---

**Note:** If you want to use the Visual Studio 2017 + CMake integration, *check this how-to*

---

### 12.3.2 With *visual_studio* generator

Use this, or **visual_studio_multi**, if you are maintaining your Visual Studio projects, and want to use Conan to to tell Visual Studio how to find your third-party dependencies.

You can use the **visual_studio** generator to manage your requirements via your *Visual Studio* project.

This generator creates a Visual Studio project properties file, with all the *include paths*, *lib paths*, *libs*, *flags* etc, that can be imported in your project.

Open `conanfile.txt` and change (or add) the **visual_studio** generator:

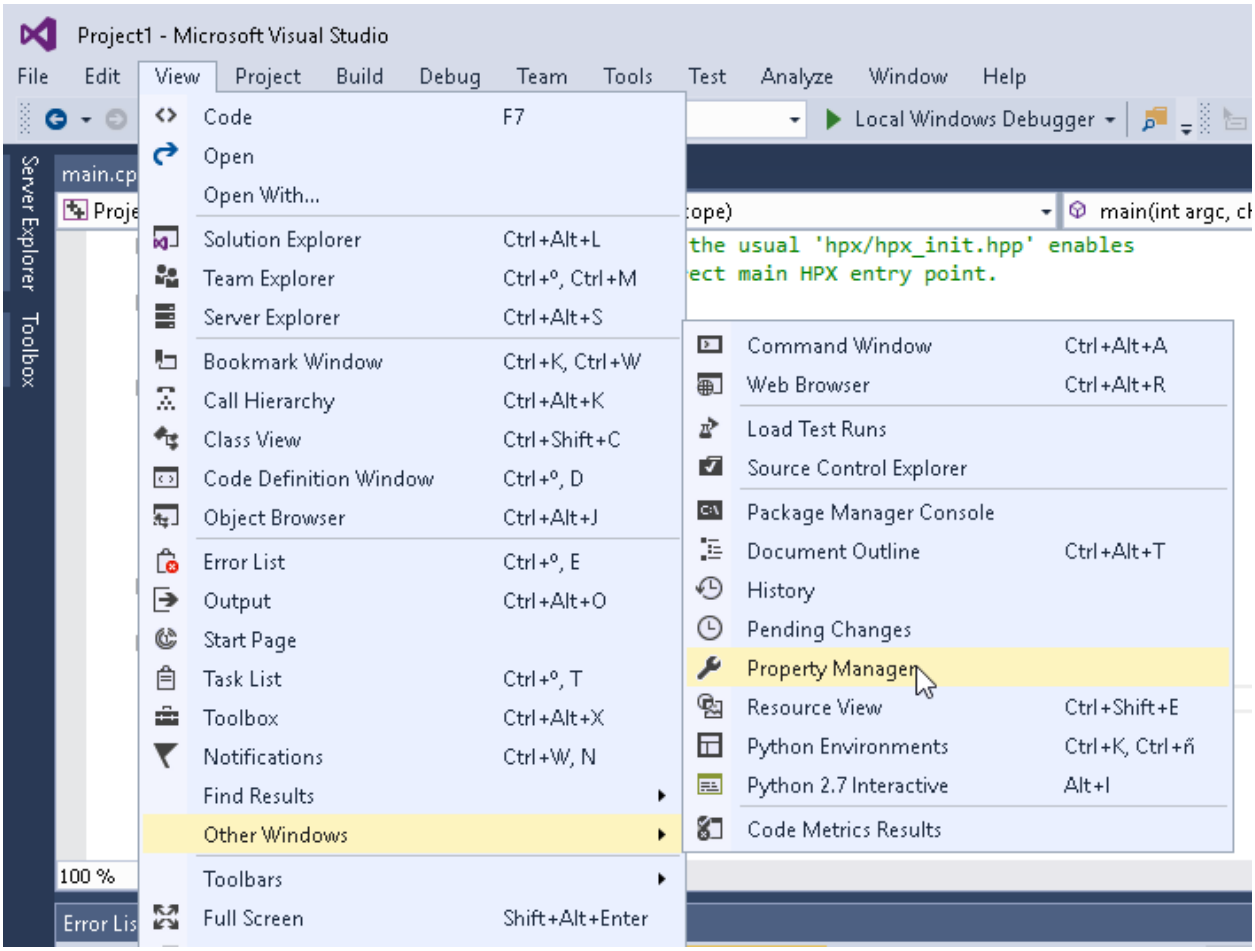
```
[requires]
Poco/1.7.8p3@pocoproject/stable

[generators]
visual_studio
```

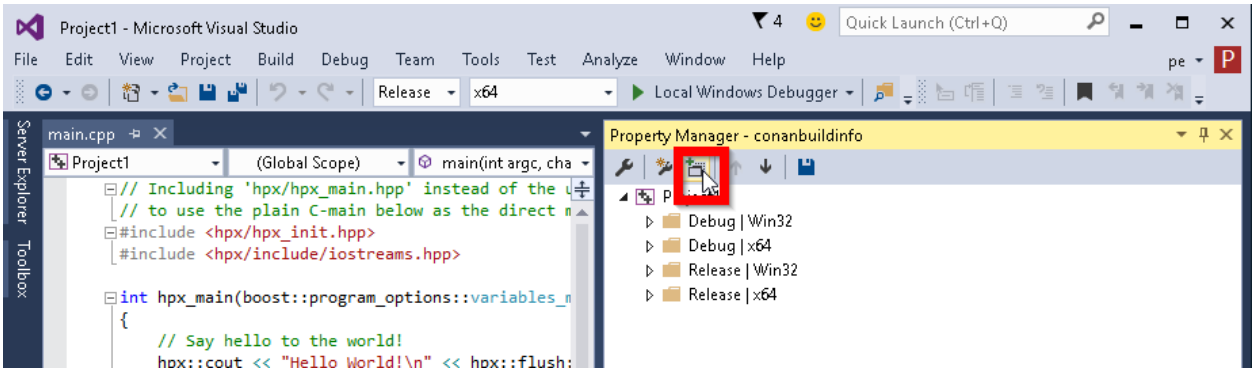
Install the requirements:

```
$ conan install .
```

Go to your Visual Studio project, and open the **Property Manager**, usually in **View -> Other Windows -> Property Manager**.




Click the **"+"** icon and select the generated `conanbuildinfo.props` file:




Build your project as usual.

---

**Note:** Remember to set your project's architecture and build type accordingly, explicitly or implicitly, when issuing the **conan install** command. If these values don't match, you build will probably fail.

e.g. **Release/x64**

---

**See also:**

Check the *Reference/Generators/visual_studio* for the complete reference.

### 12.3.3 Calling Visual Studio compiler

You can call your Visual Studio compiler from your `build()` method using the `VisualStudioBuildEnvironment` and the `tools.vcvars_command`.

Check *Build with Visual Studio* section for more info.

### 12.3.4 Build an existing Visual Studio project

You can build an existing Visual Studio from your `build()` method using the *MSBuild()* build helper.

```
from conans import ConanFile, MSBuild

class ExampleConan(ConanFile):
    ...

    def build(self):
        msbuild = MSBuild(self)
        msbuild.build("MyProject.sln")
```

### 12.3.5 Toolsets

You can use the subsetting `toolset` of the Visual Studio compiler to specify a custom toolset. It will be automatically applied when using the `CMake()` and `MSBuild()` build helpers. The toolset can be also specified manually in these build helpers with the `toolset` parameter.

By default, Conan will not generate a new binary package if the specified `compiler.toolset` matches an already generated package for the corresponding `compiler.version`. Check the *package_id()* reference to know more.

**See also:**

- Check the *CMake()* reference section for more info.

## 12.4 Apple/Xcode

Conan can be integrated with **XCode** in two different ways:

- Using the **cmake** generator to create a **conanbuildinfo.cmake** file.
- Using the **xcode** generator to create a **conanbuildinfo.xcconfig** file.

### 12.4.1 With CMake

Check the *Integrations/cmake* section to read about the **cmake** generator. Check the official CMake docs to find out more about generating Xcode projects with CMake.

### 12.4.2 With the *xcode* generator

You can use the **xcode** generator to integrate your requirements in your *Xcode* project. This generator creates an `xcconfig` file, with all the *include paths*, *lib paths*, *libs*, *flags* etc, that can be imported in your project.

Open `conanfile.txt` and change (or add) the **xcode** generator:

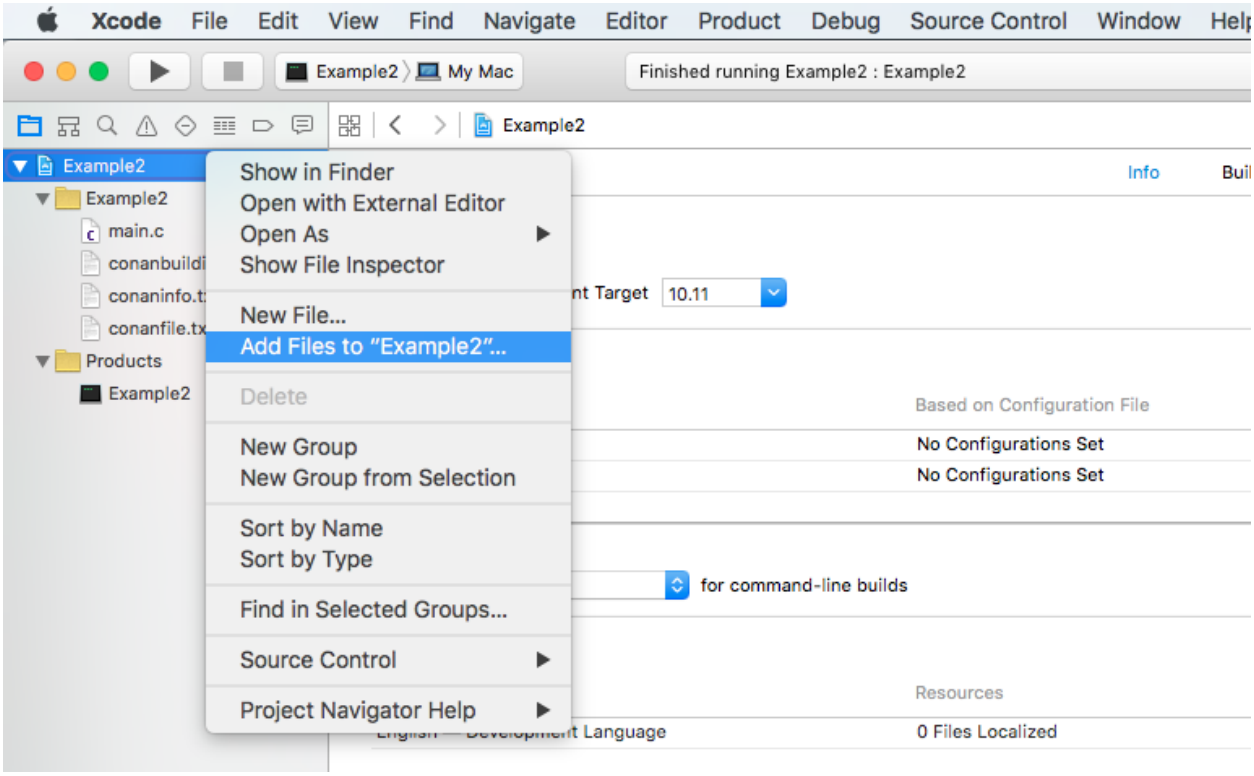
```
[requires]
Poco/1.7.8p3@pocoproject/stable

[generators]
xcode
```

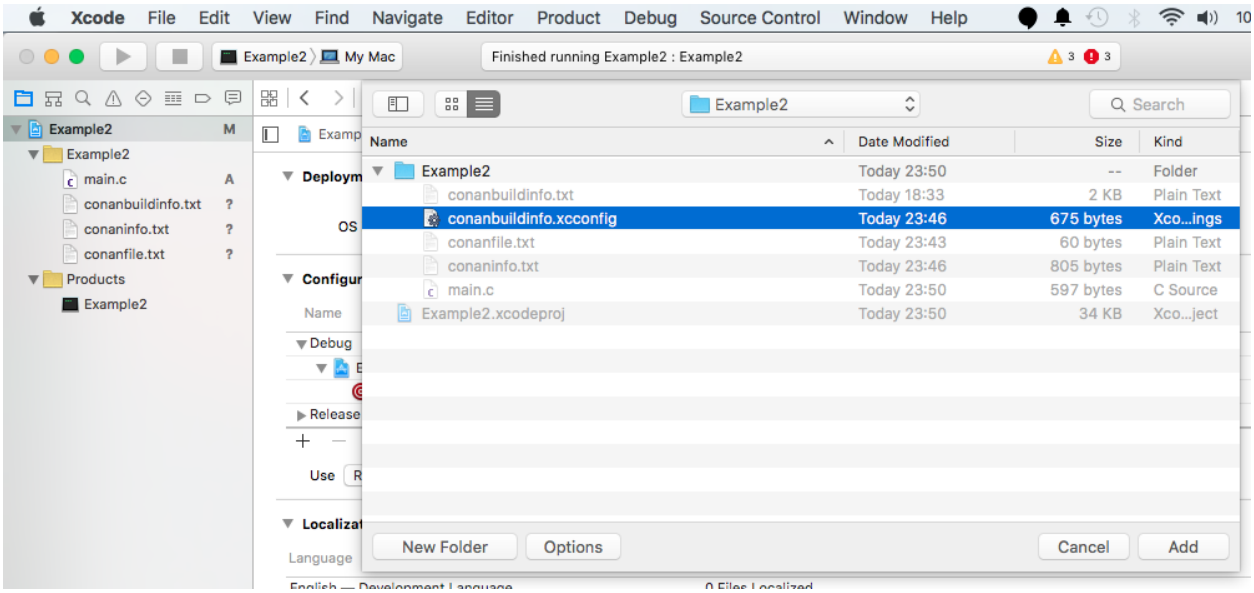
Install the requirements:

```
$ conan install .
```

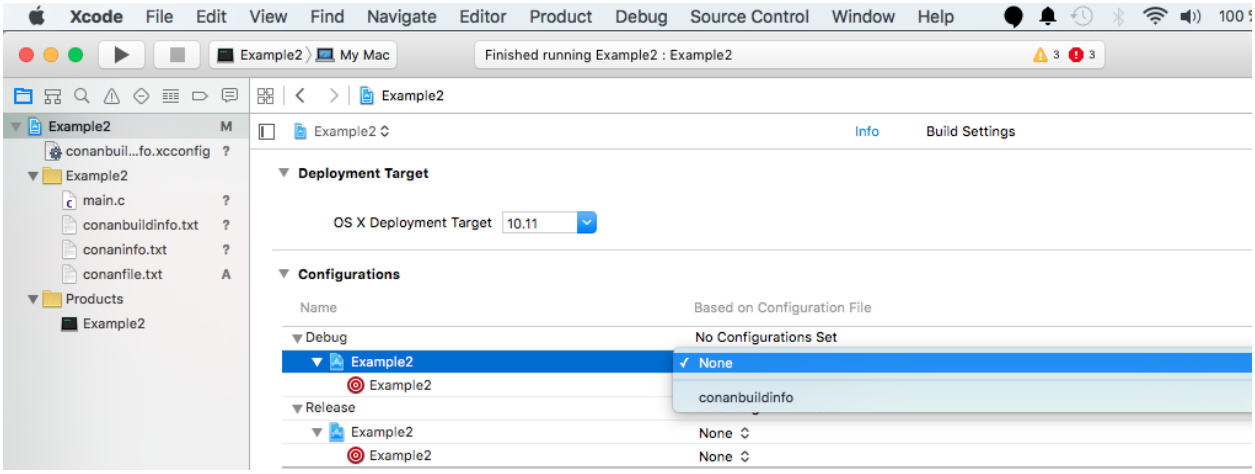
Go to your **Xcode** project, click on the project and select **Add files to**.




Choose `conanbuildinfo.xcconfig` generated.




Click on the project again. In the **info/configurations** section, choose **conanbuildinfo** for *release* and *debug*.




Build your project as usual.

**See also:**

Check the *Reference/Generators/xcode* for the complete reference.

**See also:**

Check the *Tools section about Apple tools* to ease the integration with the Apple development tools in your recipes using the toolchain as a *build require*.

**See also:**

Check the *Darwin Toolchain package* section to know how to **cross build** for `iOS`, `watchOS` and `tvOS`.

## 12.5 Compilers on command line

The **compiler_args** generator creates a file named `conanbuildinfo.args` containing a command line arguments to invoke `gcc`, `clang` or `cl` (Visual Studio) compiler.

Now we are going to compile the *getting started* example using **compiler_args** instead of the **cmake** generator.

Open `conanfile.txt` and change (or add) **compiler_args** generator:

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
compiler_args
```

Install the requirements (from the mytimer/build folder):

```
$ conan install ..
```

**Note:** Remember, if you don't specify settings in **install command** with **-s**, conan will use the detected defaults. You can always change them by editing the `~/.conan/profiles/default` or override them with "-s" parameters.

The generated `conanbuildinfo.args`:

```
-DPOCO_STATIC=ON -DPOCO_NO_AUTOMATIC_LIBS
-Ipath/to/Poco/1.7.9/pocoproject/stable/package/
↪dd758cf2da203f96c86eb99047ac152bcd0c0fa9/include
-Ipath/to/OpenSSL/1.0.2l/conan/stable/package/
↪227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/include
-Ipath/to/zlib/1.2.11/conan/stable/package/8018a4df6e7d2b4630a814fa40c81b85b9182d2b/
↪include
-m64 -DNDEBUG -Wl,-rpath,"path/to/Poco/1.7.9/pocoproject/stable/package/
↪dd758cf2da203f96c86eb99047ac152bcd0c0fa9/lib"
-Wl,-rpath,"path/to/OpenSSL/1.0.2l/conan/stable/package/
↪227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/lib"
-Wl,-rpath,"path/to/zlib/1.2.11/conan/stable/package/
↪8018a4df6e7d2b4630a814fa40c81b85b9182d2b/lib"
-Lpath/to/Poco/1.7.9/pocoproject/stable/package/
↪dd758cf2da203f96c86eb99047ac152bcd0c0fa9/lib
-Lpath/to/OpenSSL/1.0.2l/conan/stable/package/
↪227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/lib
-Lpath/to/zlib/1.2.11/conan/stable/package/8018a4df6e7d2b4630a814fa40c81b85b9182d2b/
↪lib
-lPocoUtil -lPocoMongoDB -lPocoNet -lPocoNetSSL -lPocoCrypto -lPocoData -
↪lPocoDataSQLite -lPocoZip
-lPocoXML -lPocoJSON -lPocoFoundation -lssl -lcrypto -lz -stdlib=libc++
```

This is hard to read, but those are just the **compiler_args** parameters needed to compile our program:

- **-I** options with headers directories
- **-L** for libraries directories
- **-l** for library names
- and so on... see the *complete reference here*

It's almost the same information we can see in `conanbuildinfo.cmake` and many other generators' files.

Run:

```
$ mkdir bin
$ g++ ../timer.cpp @conanbuildinfo.args -std=c++14 -o bin/timer
```

**Note:** "@conanbuildinfo.args" appends all the file contents to g++ command parameters

```
$ ./bin/timer
 Callback called after 250 milliseconds.
 ...
```

To invoke `cl` (Visual Studio compiler):

```
$ cl /EHsc timer.cpp @conanbuildinfo.args
```

You can also use the generator within your `build()` method of your conanfile.py.

Check the *Reference, generators, compiler_args* section for more info.

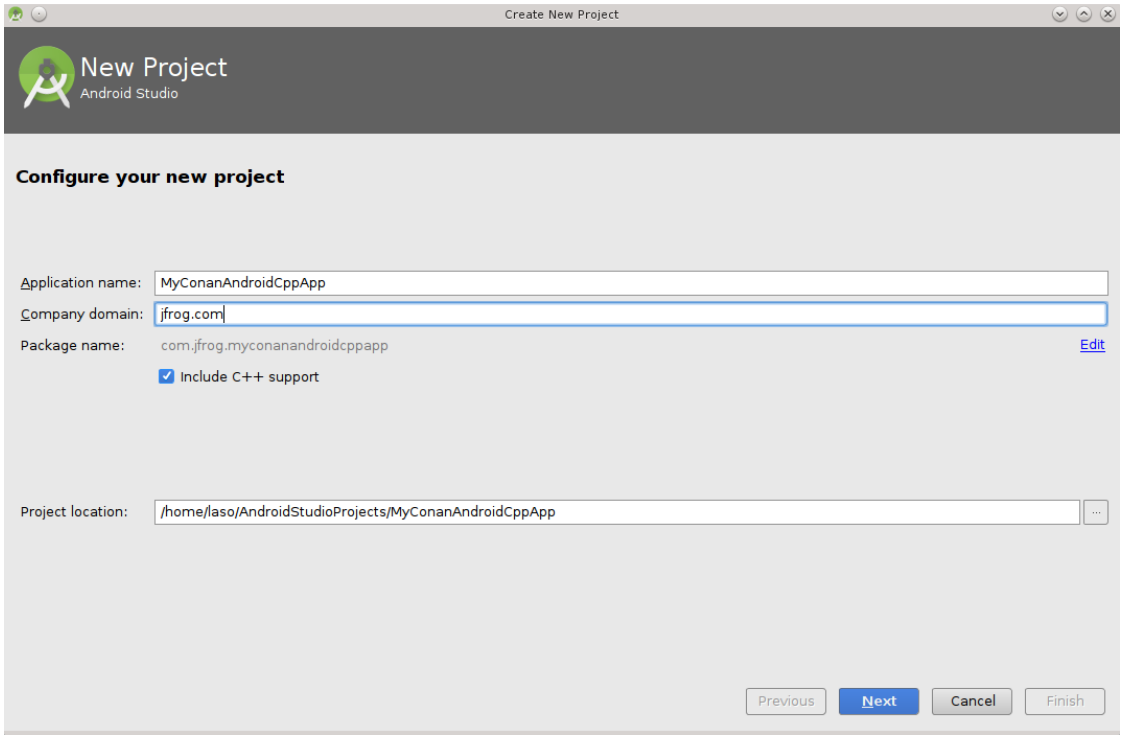
## 12.6 Android Studio

You can use Conan to *cross-build your libraries for Android* in different architectures. If you are using Android Studio for your Android application development, you can integrate it conan to automate the library building for the different architectures that you want to support in your project.

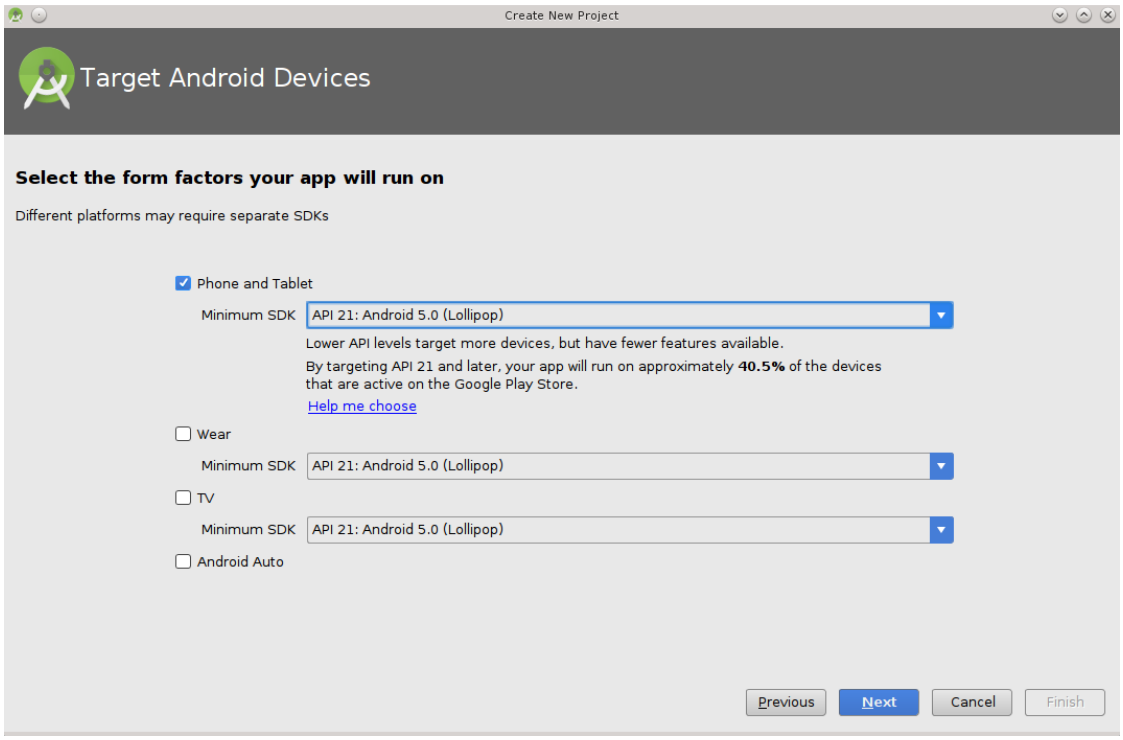
Here is an example of how to integrate the `libpng` conan package library in an Android application, but any library that can be cross-compiled to Android could be used using the same procedure.

We are going to start from the "Hello World" wizard application and then will add it the `libpng` C library:

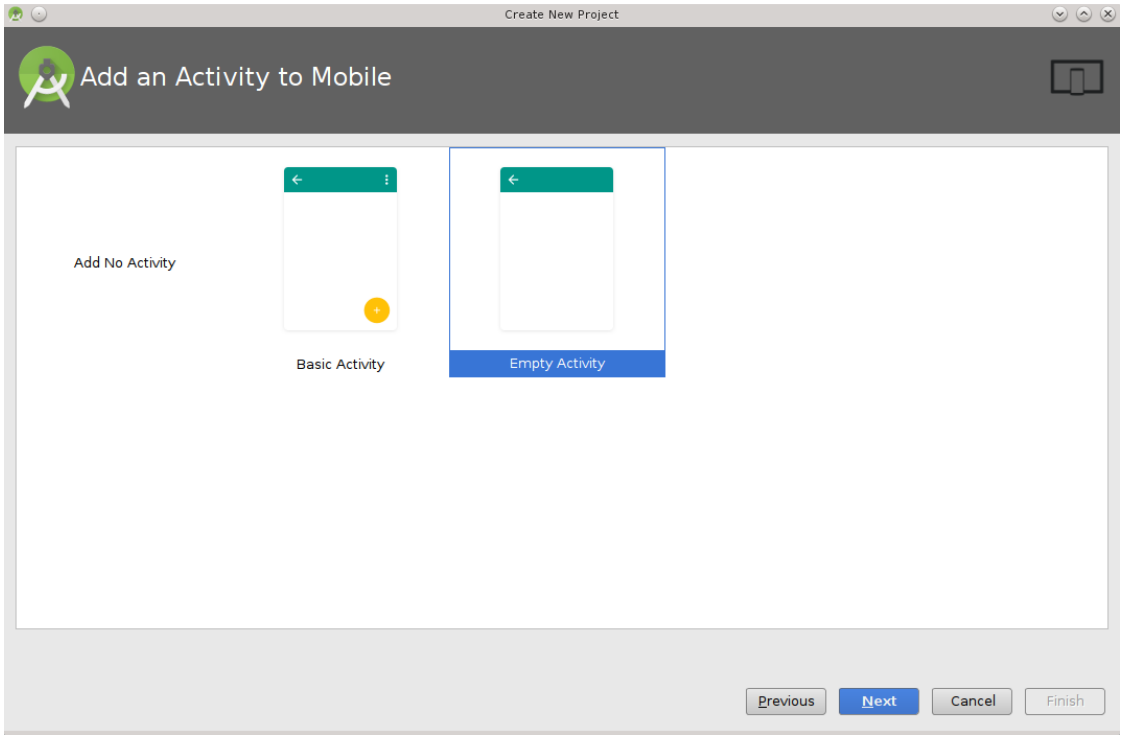
1. Follow the *cross-build your libraries for Android* guide to create a standalone toolchain and create a profile `android_21_arm_clang` for Android. You can also use the NDK that the Android Studio installs.
2. Create a new Android Studio project and include C++ support.

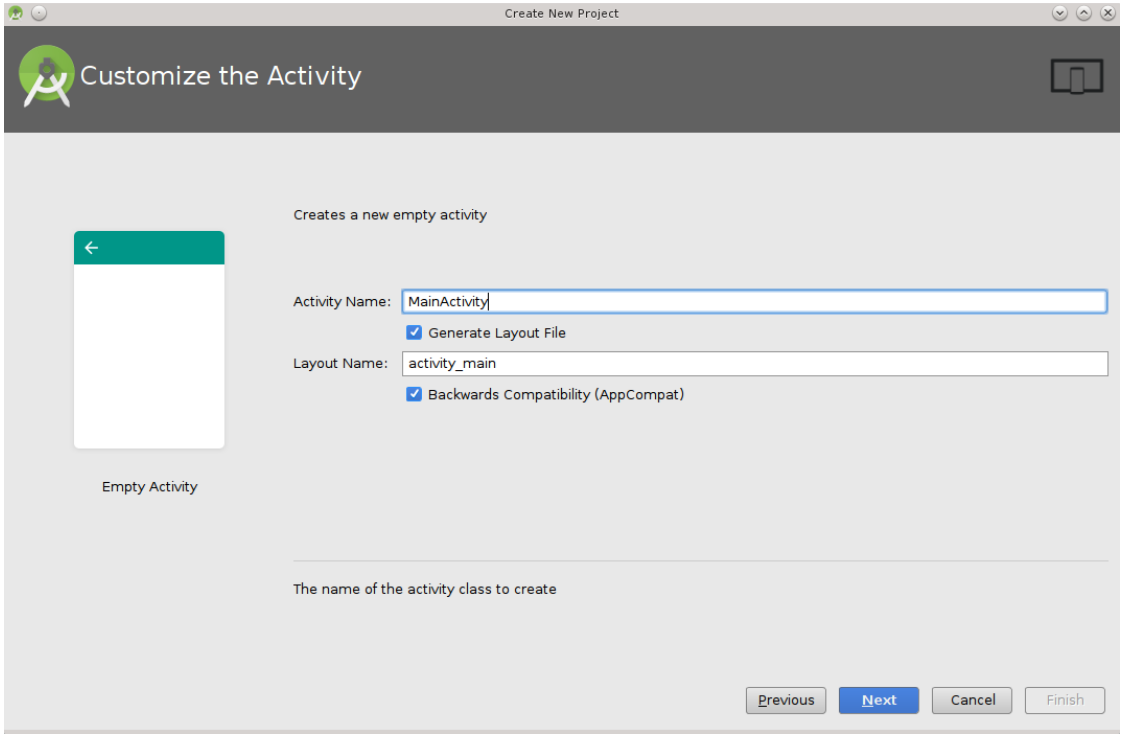



3. Select your API level and target, the arch and api level have to match with the standalone toolchain created in step 1.

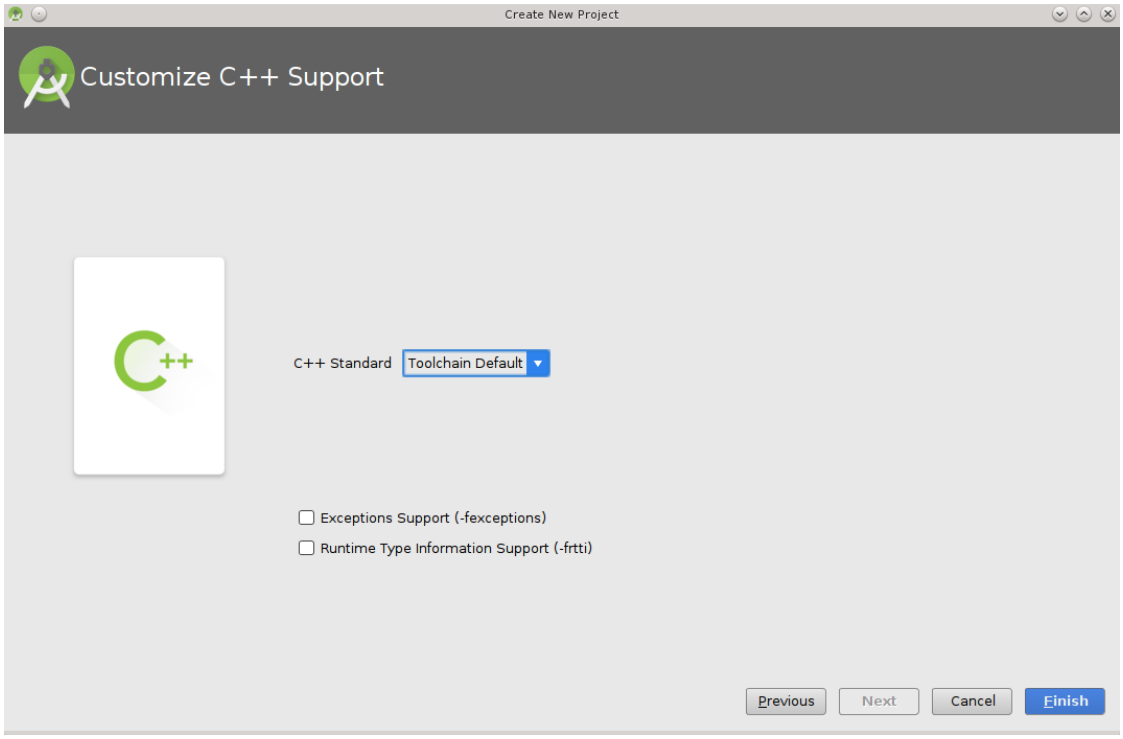



4. Add an empty Activity and name it.




5. Select the C++ standard




6. Change to the *project view* and in the *app* folder create a `conanfile.txt` with the following contents:

**conanfile.txt**

```
[requires]
libpng/1.6.23@lasote/stable

[generators]
cmake
```

7. Open the `CMakeLists.txt` file from the app folder and replace the contents with:

```
cmake_minimum_required(VERSION 3.4.1)

include(${CMAKE_CURRENT_SOURCE_DIR}/conan_build/conanbuildinfo.cmake)
set(CMAKE_CXX_COMPILER_VERSION "5.0") # Unknown miss-detection of the compiler by␣
↪CMake
conan_basic_setup(TARGETS)

add_library(native-lib SHARED src/main/cpp/native-lib.cpp)
target_link_libraries(native-lib CONAN_PKG::libpng)
```

8. Open the *app/build.gradle* file, we are configuring the architectures we want to build specifying adding a new task `conanInstall` that will call **`conan install`** to install the requirements:

- In the defaultConfig section, append:

```
ndk {
    // Specifies the ABI configurations of your native
    // libraries Gradle should build and package with your APK.
    abiFilters 'armeabi-v7a'
}
```

- After the android block:

```
task conanInstall {
    def buildDir = new File("app/conan_build")
    buildDir.mkdirs()
    // if you have problems running the command try to specify the absolute
    // path to conan (Known problem in MacOSX) /usr/local/bin/conan
    def cmmd = "conan install ../conanfile.txt --profile android_21_arm_clang --build␣
↪missing "
    print(">> ${cmmd} \n")

    def sout = new StringBuilder(), serr = new StringBuilder()
    def proc = cmmd.execute(null, buildDir)
    proc.consumeProcessOutput(sout, serr)
    proc.waitFor()
    println "$sout $serr"
    if(proc.exitValue() != 0){
        throw new Exception("out> $sout err> $serr" + "\nCommand: ${cmmd}")
    }
}
```

9. Finally open the default example cpp library in `app/src/main/cpp/native-lib.cpp` and include some lines using your library. Be careful with the JNICALL name if you used other app name in the wizard:

```
#include <jni.h>
#include <string>
#include "png.h"
#include "zlib.h"
#include <sstream>
#include <iostream>

extern "C"
JNIEXPORT jstring JNICALL
Java_com_jfrog_myconanandroidcppapp_MainActivity_stringFromJNI(
        JNIEnv *env,
        jobject /* this */) {
   std::ostringstream oss;
   oss << "Compiled with libpng: " << PNG_LIBPNG_VER_STRING << std::endl;
   oss << "Running with libpng: " << png_libpng_ver << std::endl;
   oss << "Compiled with zlib: " << ZLIB_VERSION << std::endl;
   oss << "Running with zlib: " << zlib_version << std::endl;

   return env->NewStringUTF(oss.str().c_str());
}
```

Build your project normally, conan will create a `conan` folder with a folder for each different architecture you have specified in the abiFilters with a `conanbuildinfo.cmake` file.

Then run the app using an x86 emulator for best performance:

**See also:**

Check the section *howtos/Cross building/Android* to read more about cross building for Android.

## 12.7 CLion

CLion uses **CMake** as the build system of projects, so you can use the *CMake generator* to manage your requirements in your CLion project.

Just include the `conanbuildinfo.cmake` this way:

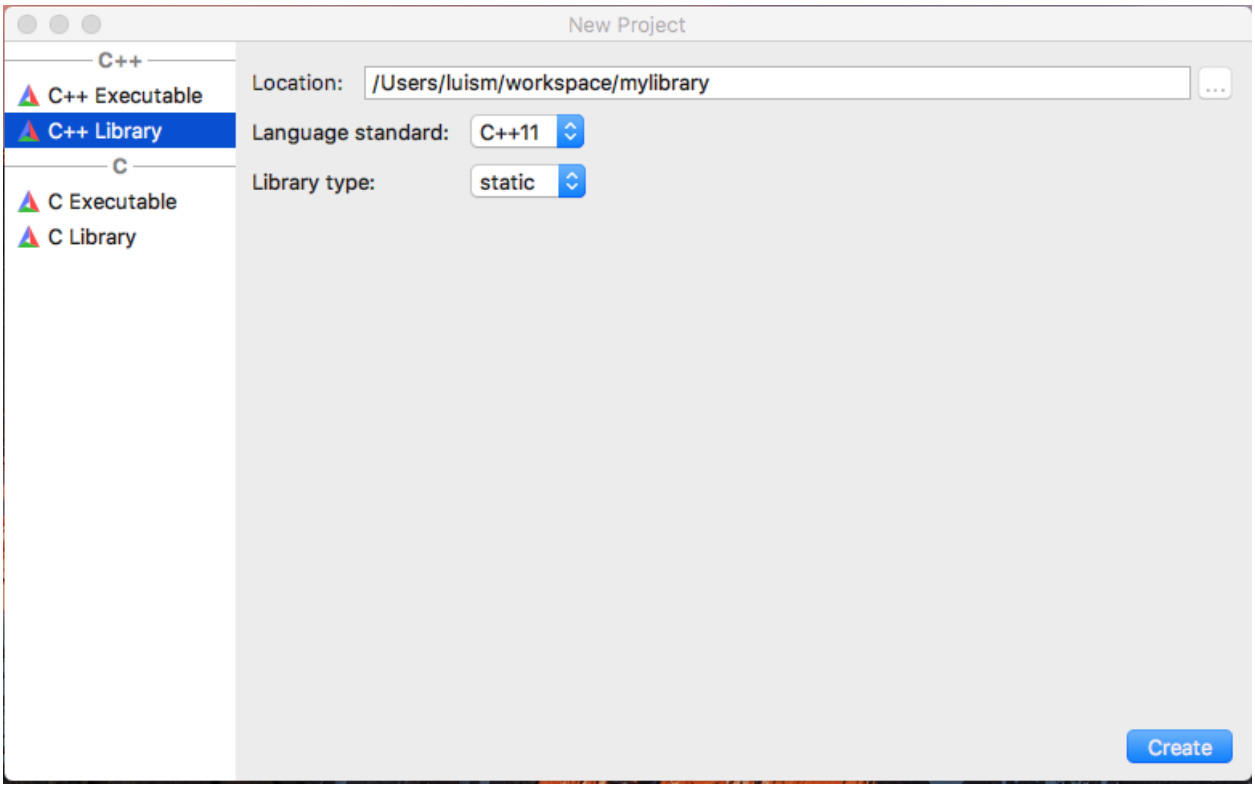
```
if(EXISTS ${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    conan_basic_setup()
else()
    message(WARNING "The file conanbuildinfo.cmake doesn't exist, you have to run␣
↪conan install first")
endif()
```

If the `conanbuildinfo.cmake` file is not found, it will print a warning message in the `Messages` console of your CLion IDE.

### 12.7.1 Using packages in a CLion project

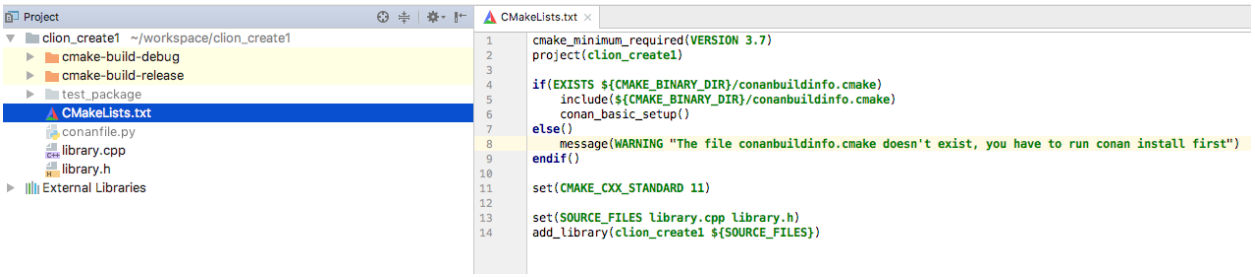
Let see an example of how to consume Conan packages in a CLion project. We are going to require and use the `zlib` conan package.

1. Create a new CLion project

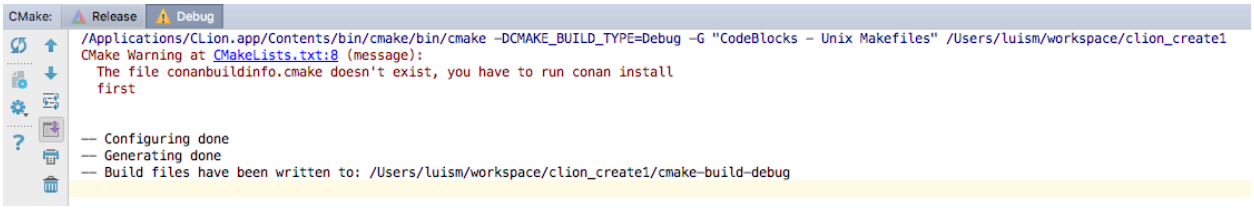



2. Edit the `CMakeLists.txt` file and add the following lines:

```
if(EXISTS ${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    conan_basic_setup()
else()
    message(WARNING "The file conanbuildinfo.cmake doesn't exist, you have to run␣
↪conan install first")
endif()
```



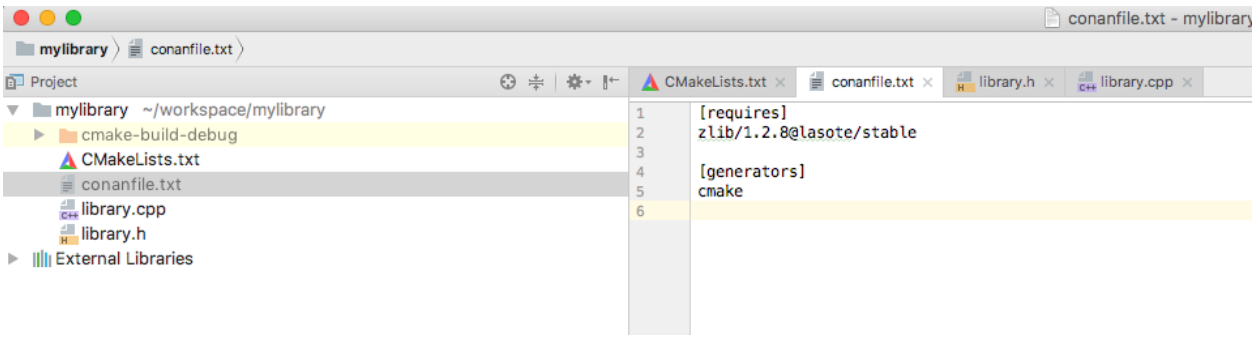
3. CLion will reload your CMake project and you will be able to see a Warning in the console, because the `conanbuildinfo.cmake` file still doesn't exists:




4. Create a `conanfile.txt` with all your requirements and use the `cmake` generator. In this case we are only requiring zlib library from a conan package:

```
[requires]
zlib/1.2.11@conan/stable

[generators]
cmake
```



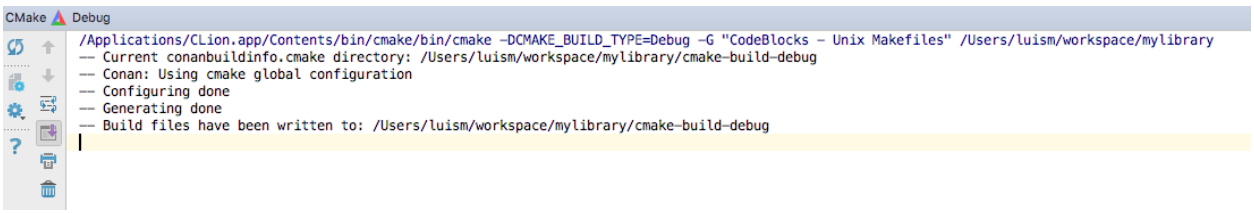

5. Now you can **`conan install`** for debug in the `cmake-build-debug` folder to install your requirements and generate the `conanbuildinfo.cmake` file there:

```
$ conan install . -s build_type=Debug --install-folder=cmake-build-debug
```

6. Repeat the last step if you have the release build types configured in your CLion IDE, but changing the build_type setting accordingly:

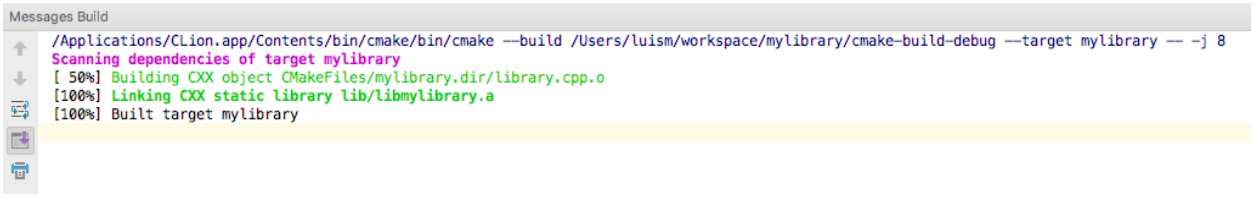
```
$ conan install . -s build_type=Release --install-folder=cmake-build-release
```

7. Now reconfigure your CLion project, the Warning message is not shown anymore:




8. Open the `library.cpp` file and include the `zlib.h`, if you follow the link you can see that CLion automatically detect the `zlib.h` header file from the local conan cache.

9. Build your project normally using your CLion IDE:

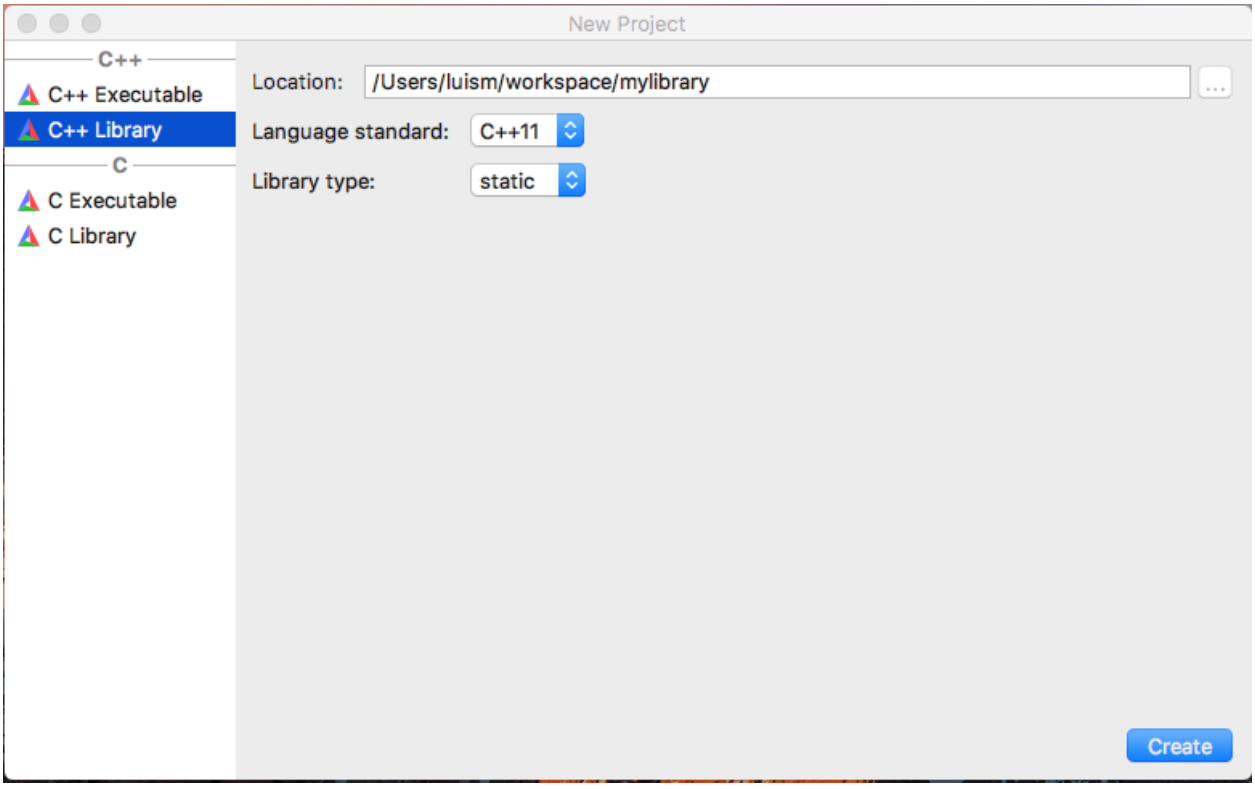



You can check a full example of a CLion project reusing conan packages in this github repository: lasote/clion-conan-consumer.

### 12.7.2 Creating conan packages in a CLion project

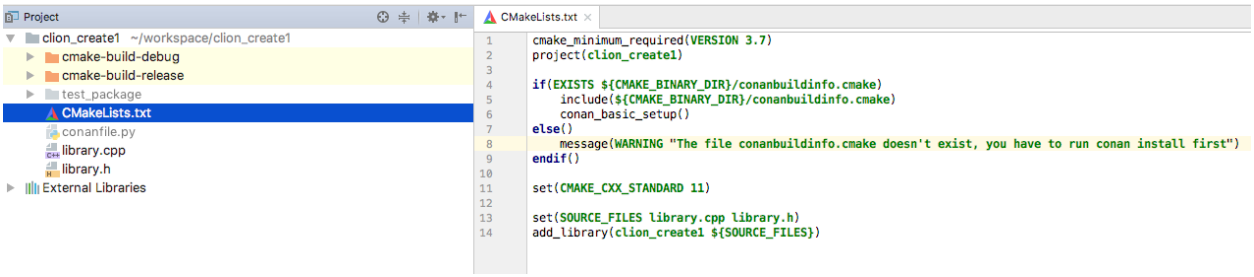
Now we are going to see how to create a conan package from the previous library.

1. Create a new CLion project




2. Edit the `CMakeLists.txt` file and add the following lines:

```
if(EXISTS ${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
    conan_basic_setup()
else()
    message(WARNING "The file conanbuildinfo.cmake doesn't exist, you have to run␣
↪conan install first")
endif()
```




3. Create a `conanfile.py` file. It's recommended to use the **`conan new`** command.

```
$ conan new mylibrary/1.0@myuser/channel
```

And edit the `conanfile.py`:

- We are removing the `source` method because we have the sources in the same project, so we can use the `exports_sources`.
- In the `package_info` method adjust the library name, in this case our `CMakeLists.txt` is creating a target library called `mylibrary`.
- Adjust the CMake helper in the `build()` method, the `cmake.configure()` doesn't need to specify the `source_folder`, because we have the `library.*` files in the root directory.
- Adjust the `copy` function calls in the `package` method to ensure that all your headers and libraries are copied to the conan package.

```
from conans import ConanFile, CMake, tools


class MylibraryConan(ConanFile):
    name = "mylibrary"
    version = "1.0"
    license = "<Put the package license here>"
    url = "<Package recipe repository url here, for issues about the package>"
    description = "<Description of Mylibrary here>"
    settings = "os", "compiler", "build_type", "arch"
    options = {"shared": [True, False]}
    default_options = {"shared": False}
    generators = "cmake"
    requires = "zlib/1.2.11@conan/stable"

    def build(self):
        cmake = CMake(self)
        cmake.configure()
        cmake.build()

        # Explicit way:
        # self.run('cmake "%s" %s' % (self.source_folder, cmake.command_line))
```

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```
        # self.run("cmake --build . %s" % cmake.build_config)

    def package(self):
        self.copy("*.h", dst="include", src="hello")
        self.copy("*.lib", dst="lib", keep_path=False)
        self.copy("*.dll", dst="bin", keep_path=False)
        self.copy("*.so", dst="lib", keep_path=False)
        self.copy("*.dylib", dst="lib", keep_path=False)
        self.copy("*.a", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["mylibrary"]
```

4. To build your library with CLion follow the guide of *Using packages from the step 5*.

5. To package your library use the **conan export-pkg** command passing the used build-folder. It will call your `package()` method to extract the artifacts and push the conan package to the local cache:

```
$ conan export-pkg . mylibrary/1.0@myuser/channel --build-folder cmake-build-debug -
↪pr=myprofile
```

7. Now you can upload it to a conan server if needed:

```
$ conan upload mylibrary/1.0@myuser/channel # This will upload only the recipe, use --
↪all to upload all the generated binary packages.
```

8. If you would like to see how the package looks like before exporting it to the local cache (conan export-pkg) you can use the **conan package** command to create the package in a local directory:

```
$ conan package . --build-folder cmake-build-debug --package-folder=mypackage
```

If we list the `mypackage` folder we can see:

- A `lib` folder containing our library
- A `include` folder containing our header files
- A `conaninfo.txt` and `conanmanifest.txt` conan files, always present in all packages.

You can check a full example of a CLion project for creating a conan package in this github repository: lasote/clion-conan-package.

## 12.8 Ninja, NMake, Borland

These build systems still don't have a conan generator for using them natively. However, if you are using cmake, you can instruct conan to use them instead of the default generator (typically `Unix Makefiles`) defining the environment variable `CONAN_CMAKE_GENERATOR`.

Read more about this variable in *Environment variables*.

## 12.9 `pkg-config` and *.pc* files

If you are creating a Conan package for a library (A) and the build system uses *.pc* files to locate its dependencies (B and C) that are Conan packages too, you can follow different approaches.

The main issue to solve is the absolute paths. When a user installs a package in the local cache, the directory will probably be different from the directory where the package was created. This could be because of the different computer, the change in Conan home directory or even a different user or channel:

For example, in the machine where the packages were created:

```
/home/user/lasote/.data/storage/zlib/1.2.11/conan/stable
```

In the machine where the library is being reused:

```
/custom/dir/.data/storage/zlib/1.2.11/conan/testing
```

You can see that *.pc* files containing absolute paths won't work to locate the dependencies.

Example of a *.pc* file with an absolute path:

```
prefix=/Users/lasote/.conan/data/zlib/1.2.11/lasote/stable/package/
↪b5d68b3533204ad67e01fa587ad28fb8ce010527
exec_prefix=${prefix}
libdir=${exec_prefix}/lib
sharedlibdir=${libdir}
includedir=${prefix}/include

Name: zlib
Description: zlib compression library
Version: 1.2.11

Requires:
Libs: -L${libdir} -L${sharedlibdir} -lz
Cflags: -I${includedir}
```

To solve this problem there are different approaches that can be followed.

### 12.9.1 Approach 1: Import and patch the prefix in the *.pc* files

In this approach your **library A** will import to a local directory the *.pc* files from **B** and **C**, then, as they will contain absolute paths, the recipe for **A** will patch the paths to match the current installation directory.

You will need to package the *.pc* files from your dependencies. You can adjust the `PKG_CONFIG_PATH` to let **`pkg-config`** tool locate them.

```
import os
from conans import ConanFile, tools

class LibAConan(ConanFile):
    name = "libA"
    version = "1.0"
    settings = "os", "compiler", "build_type", "arch"
    exports_sources = "*.cpp"
    requires = "libB/1.0@conan/stable"

    def build(self):
        lib_b_path = self.deps_cpp_info["libB"].rootpath
        copyfile(os.path.join(lib_b_path, "libB.pc"), "libB.pc")
        # Patch copied file with the libB path
        tools.replace_prefix_in_pc_file("libB.pc", lib_b_path)
```

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```
        with tools.environment_append({"PKG_CONFIG_PATH": os.getcwd()}):
            # CALL YOUR BUILD SYSTEM (configure, make etc)
            # E.g., self.run('g++ main.cpp $(pkg-config libB --libs --cflags) -o main')
```

### 12.9.2 Approach 2: Prepare and package *.pc* files before package them

With this approach you will patch the *.pc* files from B and C before packaging them. The goal is to replace the absolute path (the variable part of the path) with a variable placeholder. Then in the consumer package A, declare the variable using `--define-variable` when calling the **`pkg-config`** command.

This approach is cleaner than approach 1, because the packaged files are already prepared to be reused with or without Conan by declaring the needed variable. And it's not needed to import the *.pc* files to the consumer package. However, you need B and C libraries to package the *.pc* files correctly.

Library B recipe (preparing the *.pc* file):

```
from conans import ConanFile, tools

class LibBConan(ConanFile):
    ....

    def build(self):
        ...
        tools.replace_prefix_in_pc_file("mypcfile.pc", "${package_root_path_lib_b}")

    def package(self):
        self.copy(pattern="*.pc", dst="", keep_path=False)
```

Library A recipe (importing and consuming *.pc* file):

```
class LibAConan(ConanFile):
    ....

    requires = "libB/1.0@conan/stable, libC/1.0@conan/stable"

    def build(self):

        args = '--define-variable package_root_path_lib_b=%s' % self.deps_cpp_info[
↪"libB"].rootpath
        args += ' --define-variable package_root_path_lib_c=%s' % self.deps_cpp_info[
↪"libC"].rootpath
        pkgconfig_exec = 'pkg-config ' + args

        vars = {'PKG_CONFIG': pkgconfig_exec, # Used by autotools
                'PKG_CONFIG_PATH': "%s:%s" % (self.deps_cpp_info["libB"].rootpath,
                                              self.deps_cpp_info["libC"].rootpath)}

        with tools.environment_append(vars):
            # Call autotools (./configure ./make, will read PKG_CONFIG)
            # Or directly declare the variables:
            self.run('g++ main.cpp $(pkg-config %s libB --libs --cflags) -o main' %␣
↪args)
```

### 12.9.3 Approach 3: Use `--define-prefix`

If you have available **pkg-config** >= 0.29 and you have only one dependency, you can use directly the **--define-prefix** option to declare a custom `prefix` variable. With this approach you won't need to patch anything, just declare the correct variable.

### 12.9.4 Approach 4: Use `PKG_CONFIG_$PACKAGE_$VARIABLE`

If you have **pkg-config** >= 0.29.1 available, you can manage multiple dependencies declaring **N** variables with the prefixes:

```
class LibAConan(ConanFile):
    ....

    requires = "libB/1.0@conan/stable, libC/1.0@conan/stable"

    def build(self):

        vars = {'PKG_CONFIG_libB_PREFIX': self.deps_cpp_info["libB"].rootpath,
                'PKG_CONFIG_libC_PREFIX': self.deps_cpp_info["libC"].rootpath,
                'PKG_CONFIG_PATH': "%s:%s" % (self.deps_cpp_info["libB"].rootpath,
                                              self.deps_cpp_info["libC"].rootpath)}

        with tools.environment_append(vars):
            # Call the build system
```

### 12.9.5 Approach 5: Use the `pkg_config` generator

If you use `package_info()` in library B and library C, and specify all the library names and any other needed flag, you can use the `pkg_config` generator for **library bA**. Those files doesn't need to be patched, because are dynamically generated with the correct path.

So it can be a good solution in case you are building **library A** with a build system that manages *.pc* files like *Meson Build* or *AutoTools*:

**Meson Build**

```
from conans import ConanFile, tools, Meson
import os

class ConanFileToolsTest(ConanFile):
    generators = "pkg_config"
    requires = "LIB_A/0.1@conan/stable"
    settings = "os", "compiler", "build_type"

    def build(self):
        meson = Meson(self)
        meson.configure()
        meson.build()
```

**Autotools**

```
from conans import ConanFile, tools, AutoToolsBuildEnvironment
import os
```

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```
class ConanFileToolsTest(ConanFile):
    generators = "pkg_config"
    requires = "LIB_A/0.1@conan/stable"
    settings = "os", "compiler", "build_type"

    def build(self):
        autotools = AutoToolsBuildEnvironment(self)
        # When using the pkg_config generator, self.build_folder will be added to␣
↪PKG_CONFIG_PATH
        # so pkg_config will be able to locate the generated pc files from the␣
↪requires (LIB_A)
        autotools.configure()
        autotools.make()
```

**See also:**

Check the *tools.PkgConfig()*, a wrapper of the **pkg-config** tool that allows to extract flags, library paths, etc. for any *.pc* file.

## 12.10 Boost Build

**Caution:** This generator is deprecated in favor of the `b2` generator. See *generator b2*.

With this generator `boost-build` you can generate a `project-root.jam` file to be used with your Boost Build system.

Check the *generator boost-build*

## 12.11 B2 (Boost Build)

With this generator `b2` you can generate a `conanbuildinfo.jam` file to be used with your B2 system.

Check the *generator b2*

## 12.12 QMake

The `qmake` generator will generate a *conanbuildinfo.pri* file that can be used for your qmake builds.

```
$ conan install . -g qmake
```

Add `conan_basic_setup` to `CONFIG` and include the file in your existing project *.pro* file:

Listing 11: *yourproject.pro*

```
...

CONFIG += conan_basic_setup
include(conanbuildinfo.pri)
```

This will include all the statements in *conanbuildinfo.pri* in your project. Include paths, libraries, defines, etc. will be set up for all requirements you have defined as dependencies in a *conanfile.txt*.

If you'd rather like to manually add the variables for each dependency, you can do so by skipping the `CONFIG` statement and only including *conanbuildinfo.pri*:

Listing 12: *yourproject.pro*

```
# ...

include(conanbuildinfo.pri)

# you may now modify your variables manually for each library, such as
# INCLUDEPATH += CONAN_INCLUDEPATH_POCO
```

The `qmake` generator allows multi-configuration packages, i.e. packages that contains both Debug and Release artifacts.

### 12.12.1 Example

**Tip:** This complete example is stored in https://github.com/memsharded/qmake_example

This example project will depend on a multi-configuration (Debug/Release) "Hello World" package. It should be installed first:

```
$ git clone https://github.com/memsharded/hello_multi_config
$ cd hello_multi_config
$ conan create . memsharded/testing
Hello/0.1@memsharded/testing export: Copied 1 '.txt' file: CMakeLists.txt
Hello/0.1@memsharded/testing export: Copied 1 '.cpp' file: hello.cpp
Hello/0.1@memsharded/testing export: Copied 1 '.h' file: hello.h
Hello/0.1@memsharded/testing: A new conanfile.py version was exported
```

This hello package is created with CMake but that doesn't matter for this example, as it can be consumed from a qmake project with the configuration showed before.

Now let's get the qmake project and install its *Hello/0.1@memsharded/testing* dependency:

```
$ git clone https://github.com/memsharded/qmake_example
$ cd qmake_example
$ conan install .
PROJECT: Installing C:\Users\memsharded\qmake_example\conanfile.txt
Requirements
```

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```
    Hello/0.1@memsharded/testing from local cache - Cache
Packages
    Hello/0.1@memsharded/testing:15af85373a5688417675aa1e5065700263bf257e - Cache

Hello/0.1@memsharded/testing: Already installed!
PROJECT: Generator qmake created conanbuildinfo.pri
PROJECT: Generator txt created conanbuildinfo.txt
PROJECT: Generated conaninfo.txt
```

As you can see, we got the dependency information in the *conanbuildinfo.pri* file. You can inspect the file to see the variables generated. Now let's build the project for Release and then for Debug:

```
$ qmake
$ make
$ ./helloworld
> Hello World Release!

# now let's build the Debug one
$ make clean
$ qmake CONFIG+=debug
$ make
$ ./helloworld
> Hello World Debug!
```

**See also:**

Check the complete reference of the *qmake generator*.

## 12.13 Premake

Since Conan 1.9.0 the `premake` generator is built-in and works with **`premake5`**, so the following should be enough to use it:

```
[generators]
premake
```

### 12.13.1 Example

We are going to use the same example from *Getting Started*, a MD5 Encrypter app.

This is the main file for it:

Listing 13: main.cpp

```
#include "Poco/MD5Engine.h"
#include "Poco/DigestStream.h"

#include <iostream>
```

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```
int main(int argc, char** argv)
{
    Poco::MD5Engine md5;
    Poco::DigestOutputStream ds(md5);
    ds << "abcdefghijklmnopqrstuvwxyz";
    ds.close();
    std::cout << Poco::DigestEngine::digestToHex(md5.digest()) << std::endl;
    return 0;
}
```

As this project has relies on the Poco Libraries we are going to create a *conanfile.txt* with our requirement and declare there the Premake generator too:

Listing 14: conanfile.txt

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
premake
```

In order to use new generator within your project, use the following Premake script as a reference:

Listing 15: premake5.lua

```
-- premake5.lua

require 'conanbuildinfo'

workspace "ConanPremakeDemo"
    configurations { "Debug", "Release" }
    platforms { "Win32", "x64" }

    filter { "platforms:Win32" }
    system "Windows"
    architecture "x32"

    filter { "platforms:x64" }
    system "Windows"
    architecture "x64"

project "ConanPremakeDemo"
    kind "ConsoleApp"
    language "C++"
    targetdir "bin/%{cfg.buildcfg}"

    includedirs { conan_includedirs }
    libdirs { conan_libdirs }
    links { conan_libs }
    linkoptions { conan_exelinkflags }

    files { "**.h", "**.cpp" }

    filter "configurations:Debug"
    defines { "DEBUG", conan_cppdefines }
```

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```
    symbols "On"

    filter "configurations:Release"
    defines { "NDEBUG", conan_cppdefines }
    optimize "On"
```

Now we are going to let Conan retrieve the dependencies and generate the dependency information in a *conanbuildinfo.lua*:

```
$ conan install .
```

Then let's call **premake** to generate our project:

- Use this command for Windows Visual Studio:

```
$ premake5 vs2017  # Generates a .sln
```

- Use this command for Linux or macOS:

```
$ premake5 gmake  # Generates a makefile
```

Now you can build your project with Visual Studio or Make.

**See also:**

Check the complete reference of the *premake generator*.

## 12.14 qbs

Conan provides a **qbs** generator, it will generate a `conanbuildinfo.qbs` file that can be used for your qbs builds.

Add `conanbuildinfo.qbs` as a reference on the project level and a Depends item with the name `conanbuildinfo`:

**yourproject.qbs**

```
import qbs

Project {
   references: ["conanbuildinfo.qbs"]
   Product {
        type: "application"
        consoleApplication: true
        files: [
            "conanfile.txt",
            "main.cpp",
        ]
        Depends { name: "cpp" }
        Depends { name: "ConanBasicSetup" }
   }
}
```

This will include the product called `ConanBasicSetup` which holds all the necessary settings for all your dependencies.

If you'd rather like to manually add each dependency, just replace `ConanBasicSetup` with the dependency you would like to include. You may also specify multiple dependencies:

**yourproject.qbs**

```
import qbs

Project {
   references: ["conanbuildinfo.qbs"]
   Product {
        type: "application"
        consoleApplication: true
        files: [
            "conanfile.txt",
            "main.cpp",
        ]
        Depends { name: "cpp" }
        Depends { name: "catch" }
        Depends { name: "Poco" }
   }
}
```

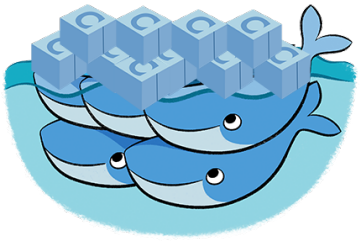
**See also:**

Check the *Reference/Generators/qbs* section for get more details.

## 12.15 Meson Build

If you are using **Meson Build** as your library build system, you can use the **Meson** build helper. This helper have `.configure()` and `.build()` methods available to ease the call to meson build system. It also will take automatically the `pc files` of your dependencies when using the *pkg_config generator*.

Check *Building with Meson Build* for more info.



## 12.16 Docker

You can easily run Conan in a Docker container to build and cross build conan packages.

Check the *'How to use docker to create and cross build C and C++ conan packages'* section to know more.

## 12.17 Git

**Conan** uses plain text files, `conanfile.txt` or `conanfile.py`, so it's perfectly suitable for the use of any version control system. We use and highly recommend git.

Check *workflows section* to know more about project layouts that naturally fit version control systems.

### 12.17.1 Temporary files

**Conan** generates some files than should not be committed, as `conanbuildinfo.*` and `conaninfo.txt`. These files can change in different computers and are re-generated with the **conan install** command.

However, these files are typically generated in the **build tree** not in the source tree, so they will be naturally disregarded. Just take care in case you have created the **build** folder inside your project (we do this in several examples in this docs). In this case, you should add it to your `.gitignore` file:

**.gitignore**

```
...
build/
```

### 12.17.2 Package creators

If you are creating a **conan** package:

- You can use the *url field* to indicate the origin of your package recipe. If you are using an external package recipe, this url should point to the package recipe repository **not** to the external source origin. If a **github** repository is detected, the conan website will link your github issues page from your conan's package page.
- You can use **git** to *obtain your sources* (requires the git client in the path) when creating external package recipes.

## 12.18 Jenkins

You can use *Jenkins CI* both for:

- Building and testing your project, which manages dependencies with Conan, and probably a conanfile.txt file
- Building and testing conan binary packages for a given conan package recipe (with a conanfile.py) and uploading to a conan remote (Artifactory or conan_server)

There is no need for any special setup for it, just install conan and your build tools in the Jenkins machine and call the needed `conan` commands.

### 12.18.1 Artifactory and Jenkins integration

If you are using Artifactory you can take advantage of the Jenkins Artifactory Plugin. Check here how to install the plugin and here you can check the full documentation about the DSL.

The Artifactory Jenkins plugin provides a powerful DSL language to call conan, connect with your Artifactory instance, upload and download your packages from Artifactory and manage your build information.

### Example: Test your project getting requirements from Artifactory

This is a template to use Jenkins with Artifactory plugin and Conan to retrieve your package from Artifactory server and publish the build information about the downloaded packages to Artifactory.

In this script we assume that we already have all our dependencies in the Artifactory server, and we are building our project that uses **Boost** and **Poco** libraries.

Create a new Jenkins Pipeline task using this script:

```
//Adjust your artifactory instance name/repository and your source code repository
def artifactory_name = "artifactory"
def artifactory_repo = "conan-local"
def repo_url = 'https://github.com/memsharded/example-boost-poco.git'
def repo_branch = 'master'

node {
    def server = Artifactory.server artifactory_name
    def client = Artifactory.newConanClient()

    stage("Get project"){
        git branch: repo_branch, url: repo_url
    }

    stage("Get dependencies and publish build info"){
        sh "mkdir -p build"
        dir ('build') {
          def b = client.run(command: "install ..")
          server.publishBuildInfo b
        }
    }

    stage("Build/Test project"){
        dir ('build') {
          sh "cmake ../ && cmake --build ."
        }
    }
}
```

### Example: Build a conan package and upload it to Artifactory

In this example we will call conan *test package* command to create a binary packages and then upload it to Artifactory. We also upload the build information:

```
def artifactory_name = "artifactory"
def artifactory_repo = "conan-local"
def repo_url = 'https://github.com/conan-community/conan-zlib.git'
def repo_branch = "release/1.2.11"

node {
    def server = Artifactory.server artifactory_name
    def client = Artifactory.newConanClient()
    def serverName = client.remote.add server: server, repo: artifactory_repo

    stage("Get recipe"){
        git branch: repo_branch, url: repo_url
    }
```

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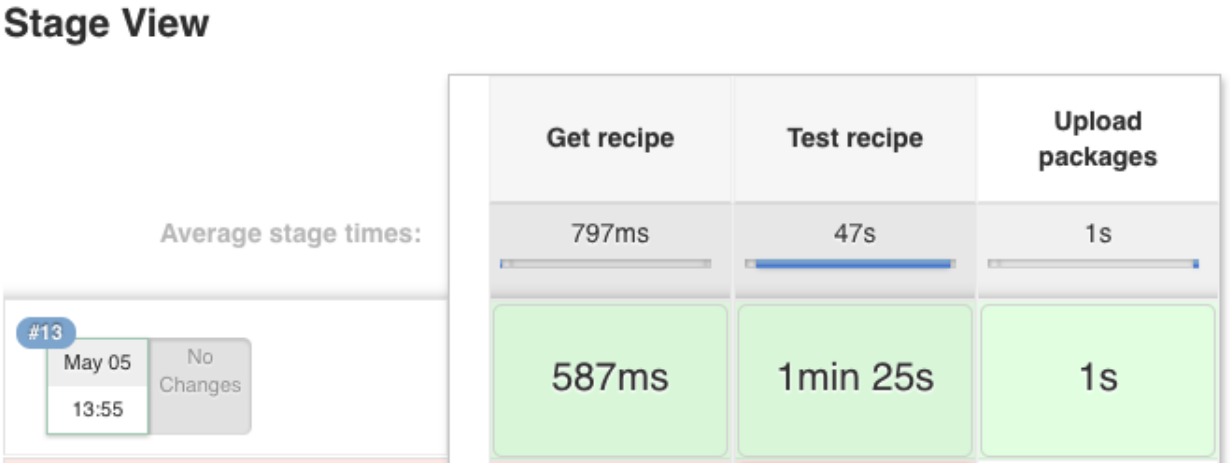
```
    stage("Test recipe"){
        client.run(command: "create")
    }

    stage("Upload packages"){
        String command = "upload * --all -r ${serverName} --confirm"
        def b = client.run(command: command)
        server.publishBuildInfo b
    }
}
```



## 12.19 Travis Ci

You can use Travis CI cloud service to automatically build and test your project in Linux/macOS environments in the cloud. It is free for OSS projects, and offers an easy integration with Github, so builds can be automatically fired in Travis-CI after a **`git push`** to Github.

You can use Travis-CI both for:

- Building and testing your project, which manages dependencies with Conan, and probably a conanfile.txt file
- Building and testing conan binary packages for a given conan package recipe (with a conanfile.py)

### 12.19.1 Building and testing your project

We are going to use an example with GTest package now, with **Travis CI** support to run the tests.

Clone the project from github:

```
$ git clone https://github.com/lasote/conan-gtest-example
```

Create a `.travis.yml` file and paste this code in it:

```
language: cpp
compiler:
- gcc
install:
# Upgrade GCC
- sudo add-apt-repository ppa:ubuntu-toolchain-r/test -y
- sudo apt-get update -qq
- sudo apt-get install -qq g++-4.9
- sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-4.9 60 --slave /
↪usr/bin/g++ g++ /usr/bin/g++-4.9

# Install conan
- pip install conan
# Automatic detection of your arch, compiler, etc.
- conan user

script:
# Download dependencies, build, test and create package
- conan create . user/channel
```

Travis will install the **conan** tool and will execute the **conan install** command. Then, the **script** section creates the build folder, compiles the project with **cmake** and runs the **tests**.

### 12.19.2 Creating, testing and uploading conan binary packages

You can use Travis to automate the building of binary packages, which will be created in the cloud after pushing to Github. You can probably setup your own way, but conan has some utilities to help in the process.

The command **`conan new`** has arguments to create a default working *.travis.yml* file. Other setups might be possible, but for this example we are assuming that you are using github and also uploading your final packages to Bintray. You could follow these steps:

1. First, create an empty github repository, let's call it "hello", for creating a "hello world" package. Github allows to create it with a Readme and .gitignore.
2. Get the credentials User and API Key (remember, Bintray uses the API key as "password", not your main Bintray account password)
3. Create a conan repository in Bintray under your user or organization, and get its URL ("Set me up"). We will call it `UPLOAD_URL`
4. Activate the repo in your Travis account, so it is built when we push changes to it.
5. Under *Travis More Options -> Settings->Environment Variables*, add the `CONAN_PASSWORD` environment variable with the Bintray API Key. If your Bintray user is different from the package user, you can define your Bintray username too, defining the environment variable `CONAN_LOGIN_USERNAME`
6. Clone the repo: `$ git clone <your_repo/hello> && cd hello`
7. Create the package: **`conan new Hello/0.1@<user>/testing -t -s -cilg -cis -ciu=UPLOAD_URL`** where **user** is your Bintray username.
8. You can inspect the created files: both *.travis.yml*, *.travis/run.sh*, and `.travis/install.sh` and the *build.py* script, that is used by **conan-package-tools** utility to split different builds with different configurations in different travis jobs.

9. You can test locally, before pushing, with **conan test**.
10. Add the changes, commit and push: **git add . && git commit -m "first commit" && git push**.
11. Go to Travis and see the build, with the different jobs.
12. When it finish, go to your Bintray repository, you should see there the uploaded packages for different configurations.
13. Check locally, searching in Bintray: **conan search Hello/0.1@<user>/testing -r=mybintray**.

If something fails, please report an issue in the `conan-package-tools` github repository: https://github.com/conan-io/conan-package-tools

## 12.20 Appveyor

You can use AppVeyor cloud service to automatically build and test your project in a Windows environment in the cloud. It is free for OSS projects, and offers an easy integration with Github, so builds can be automatically fired in Appveyor after a **git push** to Github.

You can use Appveyor both for:

- Building and testing your project, which manages dependencies with Conan, and probably a conanfile.txt file
- Building and testing conan binary packages for a given conan package recipe (with a conanfile.py)

### 12.20.1 Building and testing your project

We are going to use an example with GTest package, with **AppVeyor** support to run the tests.

Clone the project from github:

```
$ git clone https://github.com/lasote/conan-gtest-example
```

Create an `appveyor.yml` file and paste this code in it:

```
version: 1.0.{build}
    platform:
      - x64

    install:
      - cmmd: echo "Downloading conan..."
      - cmmd: set PATH=%PATH%;%PYTHON%/Scripts/
      - cmmd: pip.exe install conan
      - cmmd: conan user # Create the conan data directory
      - cmmd: conan --version

    build_script:
      - cmmd: mkdir build
```

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```
    - cmmd: conan install . -o gtest:shared=True
    - cmmd: cd build
    - cmmd: cmake ../ -DBUILD_TEST=TRUE  -G "Visual Studio 14 2015 Win64"
    - cmmd: cmake --build . --config Release

  test_script:
    - cmmd: cd bin
    - cmmd: encryption_test.exe
```

Appveyor will install the **conan** tool and will execute the **conan install** command. Then, the **build_script** section creates the build folder, compiles the project with **cmake** and the section **test_script** runs the **tests**.

### 12.20.2 Creating, testing and uploading conan binary packages

You can use Appveyor to automate the building of binary packages, which will be created in the cloud after pushing to Github. You can probably setup your own way, but conan has some utilities to help in the process.

The command **conan new** has arguments to create a default working *appveyor.yml* file. Other setups might be possible, but for this example we are assuming that you are using GitHub and also uploading your final packages to Bintray. You could follow these steps:

1. First, create an empty github repository, let's call it "hello", for creating a "hello world" package. Github allows to create it with a Readme and .gitignore.
2. Get the credentials User and API Key (remember, Bintray uses the API key as "password", not your main Bintray account password)
3. Create a conan repository in Bintray under your user or organization, and get its URL ("Set me up"). We will call it `UPLOAD_URL`
4. Activate the repo in your Appveyor account, so it is built when we push changes to it.
5. Under *Appveyor Settings->Environment*, add the `CONAN_PASSWORD` environment variable with the Bintray API Key, and encrypt it. If your Bintray user is different from the package user, you can define your Bintray username too, defining the environment variable `CONAN_LOGIN_USERNAME`
6. Clone the repo: `$ git clone <your_repo/hello> && cd hello`
7. Create the package: **conan new Hello/0.1@<user>/testing -t -s -ciw -cis -ciu=UPLOAD_URL** where **user** is your Bintray username
8. You can inspect the created files: both *appveyor.yml* and the *build.py* script, that is used by **conan-package-tools** utility to split different builds with different configurations in different appveyor jobs.
9. You can test locally, before pushing, with **conan create**
10. Add the changes, commit and push: **git add . && git commit -m "first commit" && git push**
11. Go to Appveyor and see the build, with the different jobs.
12. When it finish, go to your Bintray repository, you should see there the uploaded packages for different configurations
13. Check locally, searching in Bintray: **conan search Hello/0.1@<user>/testing -r=mybintray**

If something fails, please report an issue in the `conan-package-tools` github repository: https://github.com/conan-io/conan-package-tools

## 12.21 Gitlab

You can use Gitlab CI cloud or local service to automatically build and test your project in Linux/macOS/Windows environments. It is free for OSS projects, and offers an easy integration with Gitlab, so builds can be automatically fired in Gitlab CI after a **`git push`** to Gitlab.

You can use Gitlab CI both for:

- Building and testing your project, which manages dependencies with Conan, and probably a conanfile.txt file
- Building and testing conan binary packages for a given conan package recipe (with a conanfile.py)

### 12.21.1 Building and testing your project

We are going to use an example with GTest package, with **Gitlab CI** support to run the tests.

Clone the project from github:

```
$ git clone https://github.com/lasote/conan-gtest-example
```

Create a `.gitlab-ci.yml` file and paste this code in it:

```
image: conanio/gcc63

build:
  before_script:
    # Upgrade Conan version
    - sudo pip install --upgrade conan
    # Automatic detection of your arch, compiler, etc.
    - conan user

  script:
    # Download dependencies, build, test and create package
    - conan create . user/channel
```

Gitlab CI will install the **conan** tool and will execute the **conan install** command. Then, the **script** section creates the build folder, compiles the project with **cmake** and runs the **tests**.

On Windows the Gitlab runner may be running as a service and not have a home directory. In which case you need to set a custom value for `CONAN_USER_HOME`.

### 12.21.2 Creating, testing and uploading conan binary packages

You can use Gitlab CI to automate the building of binary packages, which will be created in the cloud after pushing to Gitlab. You can probably setup your own way, but conan has some utilities to help in the process.

The command **`conan new`** has arguments to create a default working `.gitlab-ci.yml` file. Other setups might be possible, but for this example we are assuming that you are using github and also uploading your final packages to Bintray. You could follow these steps:

1. First, create an empty gitlab repository, let's call it "hello", for creating a "hello world" package. Gitlab allows to create it with a Readme, license and .gitignore.
2. Get the credentials User and API Key (remember, Bintray uses the API key as "password", not your main Bintray account password)
3. Create a conan repository in Bintray under your user or organization, and get its URL ("Set me up"). We will call it `UPLOAD_URL`
4. Under your project page, *Settings -> Pipelines -> Add a variable*, add the `CONAN_PASSWORD` environment variable with the Bintray API Key. If your Bintray user is different from the package user, you can define your Bintray username too, defining the environment variable `CONAN_LOGIN_USERNAME`
5. Clone the repo: **`git clone <your_repo/hello> && cd hello`**.
6. Create the package: **`conan new Hello/0.1@<user>/testing -t -s -ciglg -ciglc -cis -ciu=UPLOAD_URL`** where **user** is your Bintray username.
7. You can inspect the created files: both *.gitlab-ci.yml* and the *build.py* script, that is used by **conan-package-tools** utility to split different builds with different configurations in different GitLab CI jobs.
8. You can test locally, before pushing, with **`conan create`** or by GitLab Runner.
9. Add the changes, commit and push: **`git add . && git commit -m "first commit" && git push`**.
10. Go to Pipelines page and see the pipeline, with the different jobs.
11. When it finish, go to your Bintray repository, you should see there the uploaded packages for different configurations.
12. Check locally, searching in Bintray: **`conan search Hello/0.1@<user>/testing -r=mybintray`**.

If something fails, please report an issue in the **conan-package-tools** github repository: https://github.com/conan-io/conan-package-tools

## 12.22 Circle CI

You can use Circle CI cloud to automatically build and test your project in Linux/macOS environments. It is free for OSS projects, and offers an easy integration with Github, so builds can be automatically fired in CircleCI after a `git push` to Github.

You can use CircleCI both for:

- Building and testing your project, which manages dependencies with Conan, and probably a conanfile.txt file
- Building and testing conan binary packages for a given conan package recipe (with a conanfile.py)

### 12.22.1 Building and testing your project

We are going to use an example with GTest package, with **CircleCI** support to run the tests.

Clone the project from github:

```
$ git clone https://github.com/lasote/conan-gtest-example
```

Create a `.circleci/config.yml` file and paste this code in it:

```
version: 2
gcc-6:
  docker:
    - image: conanio/gcc6
  steps:
    - checkout
    - run:
        name: Build Conan package
        command: |
          sudo pip install --upgrade conan
          conan user
          conan create . user/channel
workflows:
  version: 2
  build_and_test:
    jobs:
    - gcc-6
```

CircleCI will install the **conan** tool and will execute the **conan create** command. Then, the **script** section creates the build folder, compiles the project with **cmake** and runs the **tests**.

### 12.22.2 Creating, testing and uploading conan package binaries

You can use CircleCI to automate the building of binary packages, which will be created in the cloud after pushing to Github. You can probably setup your own way, but conan has some utilities to help in the process.

The command `conan new` has arguments to create a default working `.circleci/config.yml` file. Other setups might be possible, but for this example we are assuming that you are using github and also uploading your final packages to Bintray. You could follow these steps:

1. First, create an empty Github repository, let's call it "hello", for creating a "hello world" package. Github allows to create it with a Readme, license and .gitignore.
2. Get the credentials User and API Key (remember, Bintray uses the API key as "password", not your main Bintray account password)
3. Create a conan repository in Bintray under your user or organization, and get its URL ("Set me up"). We will call it `UPLOAD_URL`
4. Under your project page, *Settings -> Pipelines -> Add a variable*, add the `CONAN_PASSWORD` environment variable with the Bintray API Key. If your Bintray user is different from the package user, you can define your Bintray username too, defining the environment variable `CONAN_LOGIN_USERNAME`
5. Clone the repo: `$ git clone <your_repo/hello> && cd hello`
6. Create the package: `$ conan new Hello/0.1@<user>/testing -t -s -ciccg -ciccc -cicco -cis -ciu=UPLOAD_URL` where `user` is your Bintray username
7. You can inspect the created files: both `.circleci/config.yml` and the `build.py` script, that is used by `conan-package-tools` utility to split different builds with different configurations in different GitLab CI jobs.
8. You can test locally, before pushing, with `$ conan create`

9. Add the changes, commit and push: `$ git add . && git commit -m "first commit" && git push`
10. Go to Pipelines page and see the pipeline, with the different jobs.
11. When it finish, go to your Bintray repository, you should see there the uploaded packages for different configurations
12. Check locally, searching in Bintray: `$ conan search Hello/0.1@<user>/testing -r=mybintray`

If something fails, please report an issue in the `conan-package-tools` github repository: https://github.com/conan-io/conan-package-tools

## 12.23 YouCompleteMe (vim)

If you are a vim user, you are possibly already also a user of YouCompleteMe.

With this generator, you can create the necessary files for your project dependencies, so YouCompleteMe will show symbols from your conan installed dependencies for your project. You only have to add the `ycm` generator to your `conanfile`:

Listing 16: *conanfile.txt*

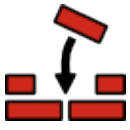
```
[generators]
ycm
```

It will generate a *conan_ycm_extra_conf.py* and a *conan_ycm_flags.json* file in your folder. Those files will be overwritten each time you run **`conan install`**.

In order to make YouCompleteMe work, copy/move *conan_ycm_extra_conf.py* to your project base folder (usually the one containing your `conanfile`) and rename it to *.ycm_extra_conf.py*.

You can (and probably should) edit this file to add your project specific configuration. If your base folder is different from your build folder, link the *conan_ycm_flags.json* from your build folder to your base folder.

```
# from your base folder
$ cp build/conan_ycm_extra_conf.py .ycm_extra_conf.py
$ ln -s build/conan_ycm_flags.json conan_ycm_flags.json
```

## 12.24  SCons

SCons can be used both to generate and consume Conan packages via the *scons* generator. The package recipe `build()` method could be similar to:

```
class PkgConan(ConanFile):
    settings = 'os', 'compiler', 'build_type', 'arch'
    requires = 'Hello/1.0@user/stable'
    generators = "scons"
    ...

    def build(self):
```

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```
        debug_opt = '--debug-build' if self.settings.build_type == 'Debug' else ''
        os.makedirs("build")
        # FIXME: Compiler, version, arch are hardcoded, not parametrized
        with tools.chdir("build"):
            self.run('scons -C {}/src {}'.format(self.source_folder, debug_opt))

    ...
```

The `SConscript` build script can load the generated `SConscript_conan` file that contains the information of the dependencies, and use it to build

```
conan = SConscript('{}/SConscript_conan'.format(build_path_relative_to_sconstruct))
if not conan:
    print("File `SConscript_conan` is missing.")
    print("It should be generated by running `conan install`.")
    sys.exit(1)

flags = conan["conan"]
version = flags.pop("VERSION")
env.MergeFlags(flags)
env.Library("hello", "hello.cpp")
```

A complete example with a *test_package* that uses SCons too is available in the following GitHub repository. Give it a try!

```
$ git clone https://github.com/memsharded/conan-scons-template
$ cd conan-scons-template
$ conan create . demo/testing
> Hello World Release!
$ conan create . demo/testing -s build_type=Debug
> Hello World Debug!
```

## 12.25 Custom integrations

If you intend to use a build system that does not have a built-in generator, you may still be able to do so. There are several options:

- First, search in bintray. Generators can now be created and contributed by users as regular packages, so you can depend on them, use versioning, and evolve faster without depending on the conan releases. See *generator packages*.
- You can use the **text or json generator**. It will generate a text file, simple to read and to parse that you can easily parse with your tools to extract the required information.
- Use the **conanfile data model** and access its properties and values, so you can directly call your build system with that information, without requiring to generate a file.
- Write and **create your own generator**. So you can upload it, version and reuse it, as well as share it with your team or community. Check *generator packages* too.

**Note:** Need help integrating your build system? Tell us what you need. info@conan.io

### 12.25.1 Use the JSON generator

Specify the **json** generator in your conanfile:

```
[requires]
fmt/4.1.0@<user>/<stable>
Poco/1.9.0@pocoproject/stable

[generators]
json
```

A file named *conanbuildinfo.json* will be generated. It will contain the information about every dependency:

```
{
  "dependencies":
  [
    {
      "name": "fmt",
      "version": "4.1.0",
      "include_paths": [
        "/path/to/.conan/data/fmt/4.1.0/<user>/<channel>/package/<id>/include"
      ],
      "lib_paths": [
        "/path/to/.conan/data/fmt/4.1.0/<user>/<channel>/package/<id>/lib"
      ],
      "libs": [
        "fmt"
      ],
      "...": "...",
    },
    {
      "name": "Poco",
      "version": "1.7.8p3",
      "...": "..."
    }
  ]
}
```

### 12.25.2 Use the text generator

Just specify the **txt** generator in your conanfile:

```
[requires]
Poco/1.9.0@pocoproject/stable

[generators]
txt
```

And a file is generated, with the same information as in the case of CMake and gcc, only in a generic, text format, containing the information from the `deps_cpp_info` and `deps_user_info`. Check the conanfile *package_info* method to know more about these objects:

```
[includedirs]
/home/laso/.conan/data/Poco/1.6.1/lasote/stable/package/
↪afafc631e705f7296bec38318b28e4361ab6787c/include
/home/laso/.conan/data/OpenSSL/1.0.2d/lasote/stable/package/
↪154942d8bccb87fbba9157e1daee62e1200e80fc/include
```

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```
/home/laso/.conan/data/zlib/1.2.8/lasote/stable/package/
↪3b92a20cb586af0d984797002d12b7120d38e95e/include

[libs]
PocoUtil
PocoXML
PocoJSON
PocoMongoDB
PocoNet
PocoCrypto
PocoData
PocoDataSQLite
PocoZip
PocoFoundation
pthread
dl
rt
ssl
crypto
z

[libdirs]
/home/laso/.conan/data/Poco/1.6.1/lasote/stable/package/
↪afafc631e705f7296bec38318b28e4361ab6787c/lib
/home/laso/.conan/data/OpenSSL/1.0.2d/lasote/stable/package/
↪154942d8bccb87fbba9157e1daee62e1200e80fc/lib
/home/laso/.conan/data/zlib/1.2.8/lasote/stable/package/
↪3b92a20cb586af0d984797002d12b7120d38e95e/lib

[bindirs]
/home/laso/.conan/data/Poco/1.6.1/lasote/stable/package/
↪afafc631e705f7296bec38318b28e4361ab6787c/bin
/home/laso/.conan/data/OpenSSL/1.0.2d/lasote/stable/package/
↪154942d8bccb87fbba9157e1daee62e1200e80fc/bin
/home/laso/.conan/data/zlib/1.2.8/lasote/stable/package/
↪3b92a20cb586af0d984797002d12b7120d38e95e/bin

[defines]
POCO_STATIC=ON
POCO_NO_AUTOMATIC_LIBS

[USER_MyRequiredLib1]
somevariable=Some Value
othervar=Othervalue

[USER_MyRequiredLib2]
myvar=34
```

### 12.25.3 Use conan data model (conanfile.py)

If you are using any other build system you can use conan too. In the `build()` method you can access your settings and build information from your requirements and pass it to your build system. Note, however, that probably is simpler and much more reusable to create a generator to simplify the task for your build system.

```
from conans import ConanFile

class MyProjectWithConan(ConanFile):
   settings = "os", "compiler", "build_type", "arch"
   requires = "Poco/1.9.0@pocoproject/stable"
   ########### IT'S IMPORTANT TO DECLARE THE TXT GENERATOR TO DEAL WITH A GENERIC␣
↪BUILD SYSTEM
   generators = "txt"
   default_options = {"Poco:shared": False, "OpenSSL:shared": False}

   def imports(self):
      self.copy("*.dll", dst="bin", src="bin") # From bin to bin
      self.copy("*.dylib*", dst="bin", src="lib") # From lib to bin

   def build(self):
      ############ Without any helper ###########
      # Settings
      print(self.settings.os)
      print(self.settings.arch)
      print(self.settings.compiler)

      # Options
      #print(self.options.my_option)
      print(self.options["OpenSSL"].shared)
      print(self.options["Poco"].shared)

      # Paths and libraries, all
      print("-------- ALL --------------")
      print(self.deps_cpp_info.include_paths)
      print(self.deps_cpp_info.lib_paths)
      print(self.deps_cpp_info.bin_paths)
      print(self.deps_cpp_info.libs)
      print(self.deps_cpp_info.defines)
      print(self.deps_cpp_info.cflags)
      print(self.deps_cpp_info.cppflags)
      print(self.deps_cpp_info.sharedlinkflags)
      print(self.deps_cpp_info.exelinkflags)

      # Just from OpenSSL
      print("--------- FROM OPENSSL -------------")
      print(self.deps_cpp_info["OpenSSL"].include_paths)
      print(self.deps_cpp_info["OpenSSL"].lib_paths)
      print(self.deps_cpp_info["OpenSSL"].bin_paths)
      print(self.deps_cpp_info["OpenSSL"].libs)
      print(self.deps_cpp_info["OpenSSL"].defines)
      print(self.deps_cpp_info["OpenSSL"].cflags)
      print(self.deps_cpp_info["OpenSSL"].cppflags)
      print(self.deps_cpp_info["OpenSSL"].sharedlinkflags)
      print(self.deps_cpp_info["OpenSSL"].exelinkflags)

      # Just from POCO
      print("--------- FROM POCO -------------")
      print(self.deps_cpp_info["Poco"].include_paths)
      print(self.deps_cpp_info["Poco"].lib_paths)
      print(self.deps_cpp_info["Poco"].bin_paths)
      print(self.deps_cpp_info["Poco"].libs)
      print(self.deps_cpp_info["Poco"].defines)
```

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```
        print(self.deps_cpp_info["Poco"].cflags)
        print(self.deps_cpp_info["Poco"].cppflags)
        print(self.deps_cpp_info["Poco"].sharedlinkflags)
        print(self.deps_cpp_info["Poco"].exelinkflags)


        # self.run("invoke here your configure, make, or others")
        # self.run("basically you can do what you want with your requirements build␣
↪info)


        # Environment variables (from requirements self.env_info objects)
        # are automatically applied in the python ``os.environ`` but can be accesible␣
↪as well:
        print("--------- Globally -------------")
        print(self.env)

        print("--------- FROM MyLib -------------")
        print(self.deps_env_info["MyLib"].some_env_var)


        # User declared variables (from requirements self.user_info objects)
        # are available in the self.deps_user_info object
        print("--------- FROM MyLib -------------")
        print(self.deps_user_info["MyLib"].some_user_var)
```

### 12.25.4 Create your own generator

There are two ways in which generators can be contributed:

- Forking and adding the new generator in the conan codebase. This will be a built-in generator. It might have a much slower release and update cycle, it needs to pass some tests before being accepted, but it has the advantage than no extra things are needed to use that generator (once released in conan)
- Creating a custom *generator package*. You can write a `conanfile.py` and add the custom logic for a generator inside that file, then upload, refer and depend on it as any other package. These generators have to be discovered (search), but they have many advantages: much faster release cycles, independent from the main conan codebase, can be versioned, so backward compatibility and upgrades are much easier.

## 12.26 Linting conanfile.py

The `conan create` command verifies the recipe file using pylint.

However, if you have an IDE that supports Python and may do linting automatically, there are false warnings caused by the fact that Conan dynamically populates some fields of the recipe based on context.

Conan provides a plugin which makes pylint aware of these dynamic fields and their types. To use it when running pylint outside Conan, just add the following to your `.pylintrc` file:

```
[MASTER]
load-plugins=conans.pylint_plugin
```

CHAPTER

# THIRTEEN

# HOWTOS

This section shows common solutions and different approaches to typical problems.

## 13.1 How to package header-only libraries

### 13.1.1 Without unit tests

Packaging a header only library, without requiring to build and run unit tests for it within conan, can be done with a very simple recipe. Assuming you have the recipe in the source repo root folder, and the headers in a subfolder called `include`, you could do:

```
from conans import ConanFile

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    # No settings/options are necessary, this is header only
    exports_sources = "include/*"
    no_copy_source = True

    def package(self):
        self.copy("*.h")
```

If you want to package an external repository, you can use the `source()` method to do a clone or download instead of the `exports_sources` fields.

- There is no need for `settings`, as changing them will not affect the final package artifacts
- There is no need for `build()` method, as header-only are not built
- There is no need for a custom `package_info()` method. The default one already adds "include" subfolder to the include path
- `no_copy_source = True` will disable the copy of the source folder to the build directory as there is no need to do so because source code is not modified at all by the `configure()` or `build()` methods.
- Note that this recipe has no other dependencies, settings or options. If it had any of those, it would be very convenient to add the `package_id()` method, to ensure that only one package with always the same ID is create irrespective of the configurations and dependencies:

```
def package_id(self):
    self.info.header_only()
```

Package is created with:

```
$ conan create . user/channel
```

### 13.1.2 With unit tests

If you want to run the library unit test while packaging, you would need this recipe:

```
from conans import ConanFile, CMake

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "arch", "build_type"
    exports_sources = "include/*", "CMakeLists.txt", "example.cpp"
    no_copy_source = True

    def build(self): # this is not building a library, just tests
        cmake = CMake(self)
        cmake.configure()
        cmake.build()
        cmake.test()

    def package(self):
        self.copy("*.h")

    def package_id(self):
        self.info.header_only()
```

**Tip:** If you are *cross building* your **library** or **app** you'll probably need to skip the **unit tests** because your target binary cannot be executed in current building host. To do it you can use *tools.get_env()* in combination with *CONAN_RUN_TESTS* env variable, defined as **False** in profile for cross building and replace `cmake.test()` with:

```
if tools.get_env("CONAN_RUN_TESTS", True):
    cmake.test()
```

Which will use a `CMakeLists.txt` file in the root folder:

```
project(Package CXX)
cmake_minimum_required(VERSION 2.8.12)

include_directories("include")
add_executable(example example.cpp)

enable_testing()
add_test(NAME example
        WORKING_DIRECTORY ${CMAKE_BINARY_DIR}/bin
        COMMAND example)
```

and some `example.cpp` file, which will be our "unit test" of the library:

```
#include <iostream>
#include "hello.h"

int main() {
```

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```
    hello();
}
```

- This will use different compilers and versions, as configured by conan settings (in command line or profiles), but will always generate just 1 output package, always with the same ID.
- The necessary files for the unit tests, must be `exports_sources` too (or retrieved from `source()` method)
- If the package had dependencies, via `requires`, it would be necessary to add the `generators = "cmake"` to the package recipe and adding the `conanbuildinfo.cmake` file to the testing CMakeLists.txt:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()

add_executable(example example.cpp)
target_link_libraries(example ${CONAN_LIBS}) # not necessary if dependencies are also␣
↪header-only
```

Package is created with:

```
$ conan create . user/channel
```

**Note:** This with/without tests is referring to running full unitary tests over the library, which is different to the **`test`** functionality that checks the integrity of the package. The above examples are describing the approaches for unit-testing the library within the recipe. In either case, it is recommended to have a *test_package* folder, so the **`conan create`** command checks the package once it is created. Check the *packaging getting started guide*

## 13.2 How to launch conan install from cmake

It is possible to launch **`conan install`** from cmake, which can be convenient for end users, package consumers, that are not creating packages themselves.

This is work under **testing**, please try it and give feedback or contribute. The CMake code to do this task is here: https://github.com/conan-io/cmake-conan

To be able to use it, you can directly download the code from your CMake script:

Listing 1: *CMakeLists.txt*

```
cmake_minimum_required(VERSION 2.8)
project(myproject CXX)

# Download automatically, you can also just copy the conan.cmake file
if(NOT EXISTS "${CMAKE_BINARY_DIR}/conan.cmake")
   message(STATUS "Downloading conan.cmake from https://github.com/conan-io/cmake-
↪conan")
   file(DOWNLOAD "https://raw.githubusercontent.com/conan-io/cmake-conan/master/conan.
↪cmake"
                 "${CMAKE_BINARY_DIR}/conan.cmake")
endif()

include(${CMAKE_BINARY_DIR}/conan.cmake)
```

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```
conan_cmake_run(REQUIRES Hello/0.1@memsharded/testing
                BASIC_SETUP
                BUILD missing)

add_executable(main main.cpp)
target_link_libraries(main ${CONAN_LIBS})
```

If you want to use targets, you could do:

```
include(conan.cmake)
conan_cmake_run(REQUIRES Hello/0.1@memsharded/testing
                BASIC_SETUP CMAKE_TARGETS
                BUILD missing)

add_executable(main main.cpp)
target_link_libraries(main CONAN_PKG::Hello)
```

## 13.3 How to create and reuse packages based on Visual Studio

Conan has different helpers to manage Visual Studio and MSBuild based projects. This how-to illustrates how to put them together to create and consume packages that are purely based on Visual Studio. This how-to is using VS2015, but other versions can be used too.

### 13.3.1 Creating packages

Start cloning the existing example repository, containing a simple "Hello World" library, and application:

```
$ git clone https://github.com/memsharded/hello_vs
$ cd hello_vs
```

It contains a `src` folder with the source code and a `build` folder with a Visual Studio 2015 solution, containing 2 projects: the HelloLib static library, and the Greet application. Open it:

```
$ build\HelloLib\HelloLib.sln
```

You should be able to select the `Greet` subproject -> `Set as Startup Project`. Then build and run the app with Ctrl+F5. (Debug -> Start Without Debugging)

```
$ Hello World Debug!
# Switch IDE to Release mode, repeat
$ Hello World Release!
```

Because the `hello.cpp` file contains an `#ifdef _DEBUG` to switch between debug and release message.

In the repository, there is already a `conanfile.py` recipe:

```
from conans import ConanFile, MSBuild

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    license = "MIT"
```

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```
    url = "https://github.com/memsharded/hello_vs"
    settings = "os", "compiler", "build_type", "arch"
    exports_sources = "src/*", "build/*"

    def build(self):
        msbuild = MSBuild(self)
        msbuild.build("build/HelloLib/HelloLib.sln")

    def package(self):
        self.copy("*.h", dst="include", src="src")
        self.copy("*.lib", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["HelloLib"]
```

This recipe is using the *MSBuild() build helper* to build the `sln` project. If our recipe had `requires`, the `MSBUILD` helper will also take care of inject all the needed information from the requirements, as include directories, library names, definitions, flags etc to allow our project to locate the declared dependencies.

The recipe contains also a `test_package` folder with a simple example consuming application. In this example, the consuming application is using cmake to build, but it could also use Visual Studio too. We have left the cmake one because it is the default generated with **`conan new`**, and also to show that packages created from Visual Studio projects can also be consumed with other build systems like CMake.

Once we want to create a package, it is advised to close VS IDE, clean the temporary build files from VS to avoid problems, then create and test the package (here it is using system defaults, assuming they are Visual Studio 14, Release, x86_64):

```
# close VS
$ git clean -xdf
$ conan create . memsharded/testing
...
> Hello World Release!
```

Instead of closing the IDE and running command:*git clean* we could also configure a smarter filter in `exports_sources` field, so temporary build files are not exported into the recipe.

This process can be repeated to create and test packages for different configurations:

```
$ conan create . memsharded/testing -s arch=x86
$ conan create . memsharded/testing -s compiler="Visual Studio" -s compiler.
↪runtime=MDd -s build_type=Debug
$ conan create . memsharded/testing -s compiler="Visual Studio" -s compiler.
↪runtime=MDd -s build_type=Debug -s arch=x86
```

**Note:** It is not mandatory to specify the `compiler.runtime` setting. If it is not explicitly defined, Conan will automatically use `runtime=MDd` for `build_type==Debug` and `runtime=MD` for `build_type==Release`.

You can list the different created binary packages:

```
$ conan search Hello/0.1@memsharded/testing
```

### 13.3.2 Uploading binaries

Your locally created packages can already be uploaded to a conan remote. If you created them with the original username "memsharded", as from the git clone, you might want to do a **conan copy** to put them on your own username. Of course, you can also directly use your user name in **conan create**.

Another alternative is to configure the permissions in the remote, to allow uploading packages with different usernames. By default artifactory will do it but conan server won't: permissions must be given in `[write_permissions]` section of `server.conf`.

### 13.3.3 Reusing packages

To use existing packages directly from Visual Studio, conan provides the `visual_studio` generator. Let's clone an existing "Chat" project, consisting of a ChatLib static library that makes use of the previous "Hello World" package, and a MyChat application, calling the ChatLib library function.

```
$ git clone https://github.com/memsharded/chat_vs
$ cd chat_vs
```

As above, the repository contains a Visual Studio solution in the `build` folder. But if you try to open it, it will fail to load. This is because it is expecting to find a file with the required information about dependencies, so it is necessary to obtain that file first. Just run:

```
$ conan install .
```

You will see that it created two files, a `conaninfo.txt` file, containing the current configuration of dependencies, and a `conanbuildinfo.props` file, containing the Visual Studio properties (like `<AdditionalIncludeDirectories>`), so it is able to find the installed dependencies.

Now you can open the IDE and build and run the app (by the way, the chat function is just calling the `hello()` function two or three times, depending on the build type):

```
$  build\ChatLib\ChatLib.sln
# Switch to Release
# MyChat -> Set as Startup Project
# Ctrl + F5 (Debug -> Run without debugging)
> Hello World Release!
> Hello World Release!
```

If you wish to link with the debug version of Hello package, just install it and change IDE build type:

```
$ conan install . -s build_type=Debug -s compiler="Visual Studio" -s compiler.
↪runtime=MDd
# Switch to Debug
# Ctrl + F5 (Debug -> Run without debugging)
> Hello World Debug!
> Hello World Debug!
> Hello World Debug!
```

Now you can close the IDE and clean the temporary files:

```
# close VS IDE
$ git clean -xdf
```

Again, there is a `conanfile.py` package recipe in the repository, together with a `test_package`. The recipe is almost identical to the above one, just with two minor differences:

```
requires = "Hello/0.1@memsharded/testing"
...
generators = "visual_studio"
```

This will allow us to create and test the package of the ChatLib library:

```
$ conan create . memsharded/testing
> Hello World Release!
> Hello World Release!
```

You can also repeat the process for different build types and architectures.

### 13.3.4 Other configurations

The above example works as-is for VS2017, because VS supports upgrading from previous versions. The `MSBuild()` already implements such functionality, so building and testing packages with VS2017 can be done.

```
$ conan create . demo/testing -s compiler="Visual Studio" -s compiler.version=15
```

If you have to build for older versions of Visual Studio, it is also possible. In that case, you would probably have different solution projects inside your build folder. Then the recipe only has to select the correct one, something like:

```
def build(self):
    # assuming HelloLibVS12, HelloLibVS14 subfolders
    sln_file = "build/HelloLibVS%s/HelloLib.sln" % self.settings.compiler.version
    msbuild = MSBuild(self)
    msbuild.build(sln_file)
```

Finally, we used just one `conanbuildinfo.props` file, which the solution loaded at a global level. You could also define multiple `conanbuildinfo.props` files, one per configuration (Release/Debug, x86/x86_64), and load them accordingly.

---

**Note:** So far, the `visual_studio` generator is single-configuration (packages containing debug or release artifacts, the generally recommended approach), it does not support multi-config packages (packages containing both debug and release artifacts). Please report and provide feedback (submit an issue in github) to request this feature if necessary.

---

## 13.4 Creating and reusing packages based on Makefiles

Conan can create packages and reuse them with Makefiles. The `AutoToolsBuildEnvironment` build helper helps with most of the necessary task.

This how-to has been tested in Windows with MinGW and Linux with gcc. It is using static libraries but could be extended to shared libraries too. The Makefiles surely can be improved they are just an example.

### 13.4.1 Creating packages

Start cloning the existing example repository, containing a simple "Hello World" library, and application:

```
$ git clone https://github.com/memsharded/conan-example-makefiles
$ cd conan-example-makefiles
$ cd hellolib
```

It contains a *src* folder with the source code and a *conanfile.py* file for creating a package.

Inside the *src* folder, there is *Makefile* to build the static library. This *Makefile* is using standard variables like `$(CPPFLAGS)` or `$(CXX)` to build it:

```
SRC = hello.cpp
OBJ = $(SRC:.cpp=.o)
OUT = libhello.a
INCLUDES = -I.

.SUFFIXES: .cpp

default: $(OUT)

.cpp.o:
    $(CXX) $(INCLUDES) $(CPPFLAGS) $(CXXFLAGS) -c $< -o $@

$(OUT): $(OBJ)
    ar rcs $(OUT) $(OBJ)
```

The *conanfile.py* file uses the `AutoToolsBuildEnvironment` build helper. This helper defines the necessary environment variables with information from dependencies, as well as other variables to match the current conan settings (like `-m32` or `-m64` based on the conan `arch` setting)

```
from conans import ConanFile, AutoToolsBuildEnvironment
from conans import tools

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"
    generators = "cmake"
    exports_sources = "src/*"

    def build(self):
        with tools.chdir("src"):
            env_build = AutoToolsBuildEnvironment(self)
            # env_build.configure() # use it to run "./configure" if using autotools
            env_build.make()

    def package(self):
        self.copy("*.h", dst="include", src="src")
        self.copy("*.lib", dst="lib", keep_path=False)
        self.copy("*.a", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["hello"]
```

With this *conanfile.py* you can create the package:

```
$ conan create . user/testing -s compiler=gcc -s compiler.version=4.9 -s compiler.
↪libcxx=libstdc++
```

### 13.4.2 Using packages

Now let's move to the application folder:

```
$ cd ../helloapp
```

There you can see also a *src* folder with a *Makefile* creating an executable:

```
SRC = app.cpp
OBJ = $(SRC:.cpp=.o)
OUT = app
INCLUDES = -I.

.SUFFIXES: .cpp

default: $(OUT)

.cpp.o:
    $(CXX) $(CPPFLAGS) $(CXXFLAGS) -c $< -o $@

$(OUT): $(OBJ)
    $(CXX) -o $(OUT)  $(OBJ)  $(LDFLAGS)  $(LIBS)
```

And also a *conanfile.py* very similar to the previous one, in this case adding a `requires` and a `deploy()` method:

```
from conans import ConanFile, AutoToolsBuildEnvironment
from conans import tools

class AppConan(ConanFile):
    name = "App"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"
    exports_sources = "src/*"
    requires = "Hello/0.1@user/testing"

    def build(self):
        with tools.chdir("src"):
            env_build = AutoToolsBuildEnvironment(self)
            env_build.make()

    def package(self):
        self.copy("*app", dst="bin", keep_path=False)
        self.copy("*app.exe", dst="bin", keep_path=False)

    def deploy(self):
        self.copy("*", src="bin", dst="bin")
```

Note that in this case, the `AutoToolsBuildEnvironment` will automatically set values to `CPPFLAGS`, `LDFLAGS`, `LIBS`, etc. existing in the *Makefile* with the correct include directories, library names, etc. to properly build and link with the `hello` library contained in the "Hello" package.

As above, we can create the package with:

```
$ conan create . user/testing -s compiler=gcc -s compiler.version=4.9 -s compiler.
↪libcxx=libstdc++
```

There are different ways to run executables contained in packages, like using `virtualrunenv` generators. In this case, as the package has a `deploy()` method, we can use it:

```
$ conan install Hello/0.1user/testing -s compiler=gcc -s compiler.version=4.9 -s␣
↪compiler.libcxx=libstdc++
$ ./bin/app
$ Hello World Release!
```

## 13.5 How to manage the GCC >= 5 ABI

In the GCC 5.1 released the libstdc++, which introduced a new library ABI that includes new implementations of `std::string` and `std::list`. These changes were necessary to conform to the 2011 C++ standard which forbids Copy-On-Write strings and requires lists to keep track of their size.

You can choose which ABI to use in your Conan packages by adjusting the `compiler.libcxx`:

- **libstdc++**: Old ABI.
- **libstdc++11**: New ABI.

When Conan creates the default profile the first time it runs, it adjusts the `compiler.libcxx` setting to `libstdc++` for backwards compatibility. However, if you are using GCC >= 5 your compiler is likely to be using the new CXX11 ABI by default (libstdc++11).

If you want Conan to use the new ABI, edit the default profile at `~/.conan/profiles/default` adjusting `compiler.libcxx=libstdc++11` or override this setting in the profile you are using.

If you are using the *CMake build helper* or the *AutotoolsBuildEnvironment build helper* Conan will adjust automatically the `_GLIBCXX_USE_CXX11_ABI` flag to manage the ABI.

## 13.6 Using Visual Studio 2017 - CMake integration

Visual Studio 2017 comes with a CMake integration that allows to just open a folder that contains a *CMakeLists.txt* and Visual will use it to define the project build.

Conan can also be used in this setup to install dependencies. Let's say that we are going to build an application, that depends on an existing Conan package called `Hello/0.1@user/testing`. For the purpose of this example, you can quickly create this package typing in your terminal:

```
$ conan new Hello/0.1 -s
$ conan create . user/testing # Default conan profile is Release
$ conan create . user/testing -s build_type=Debug
```

The project we want to develop will be a simple application, with these 3 files in the same folder:

Listing 2: **example.cpp**

```
#include <iostream>
#include "hello.h"

int main() {
    hello();
    std::cin.ignore();
}
```

Listing 3: **conanfile.txt**

```
[requires]
Hello/0.1@user/testing

[generators]
cmake
```

Listing 4: **CMakeLists.txt**

```
project(Example CXX)
cmake_minimum_required(VERSION 2.8.12)

include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup()

add_executable(example example.cpp)
target_link_libraries(example ${CONAN_LIBS})
```

If we open Visual Studio 2017 (with CMake support installed), and in the Menu, select "Open Folder" and select the above folder, we will see something like the following error:

```
1> Command line: C:\PROGRAM FILES (X86)\MICROSOFT VISUAL␣
↪STUDIO\2017\COMMUNITY\COMMON7\IDE\COMMONEXTENSIONS\MICROSOFT\CMAKE\CMake\bin\cmake.
↪exe  -G "Ninja" -DCMAKE_INSTALL_PREFIX:PATH="C:\Users\user\CMakeBuilds\df6639d2-
↪3ef2-bc32-abb3-2cd1bdb3c1ab\install\x64-Debug"  -DCMAKE_CXX_COMPILER="C:/Program␣
↪Files (x86)/Microsoft Visual Studio/2017/Community/VC/Tools/MSVC/14.12.25827/bin/
↪HostX64/x64/cl.exe"  -DCMAKE_C_COMPILER="C:/Program Files (x86)/Microsoft Visual␣
↪Studio/2017/Community/VC/Tools/MSVC/14.12.25827/bin/HostX64/x64/cl.exe"  -DCMAKE_
↪BUILD_TYPE="Debug" -DCMAKE_MAKE_PROGRAM="C:\PROGRAM FILES (X86)\MICROSOFT VISUAL␣
↪STUDIO\2017\COMMUNITY\COMMON7\IDE\COMMONEXTENSIONS\MICROSOFT\CMAKE\Ninja\ninja.exe"
↪"C:\Users\user\conanws\visual-cmake"
1> Working directory: C:\Users\user\CMakeBuilds\df6639d2-3ef2-bc32-abb3-
↪2cd1bdb3c1ab\build\x64-Debug
1> -- The CXX compiler identification is MSVC 19.12.25831.0
1> -- Check for working CXX compiler: C:/Program Files (x86)/Microsoft Visual Studio/
↪2017/Community/VC/Tools/MSVC/14.12.25827/bin/HostX64/x64/cl.exe
1> -- Check for working CXX compiler: C:/Program Files (x86)/Microsoft Visual Studio/
↪2017/Community/VC/Tools/MSVC/14.12.25827/bin/HostX64/x64/cl.exe -- works
1> -- Detecting CXX compiler ABI info
1> -- Detecting CXX compiler ABI info - done
1> -- Detecting CXX compile features
1> -- Detecting CXX compile features - done
1> CMake Error at CMakeLists.txt:4 (include):
1>   include could not find load file:
1>
1>     C:/Users/user/CMakeBuilds/df6639d2-3ef2-bc32-abb3-2cd1bdb3c1ab/build/x64-Debug/
↪conanbuildinfo.cmake
```

As expected, our *CMakeLists.txt* is using a `include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)`, and that file doesn't exist yet, because Conan has not installed the dependencies of this project yet. Visual Studio 2017 uses different build folders for each configuration. In this case, the default configuration at startup is `x64-Debug`. This means that we need to install the dependencies that match this configuration. Assuming that our default profile is using Visual Studio 2017 for x64 (it should typically be the default one created by Conan if VS2017 is present), then all we need to specify is the `-s build_type=Debug` setting:

```
$ conan install . -s build_type=Debug -if=C:\Users\user\CMakeBuilds\df6639d2-3ef2-
↪bc32-abb3-2cd1bdb3c1ab\build\x64-Debug
```

Now, you should be able to regenerate the CMake project from the IDE, Menu->CMake, build it, select the "example" executable to run, and run it.

Now, let's say that you want to build the Release application. You switch configuration from the IDE, and then the above error happens again. The dependencies for Release mode need to be installed too:

```
$ conan install . -if=C:\Users\user\CMakeBuilds\df6639d2-3ef2-bc32-abb3-
↪2cd1bdb3c1ab\build\x64-Release
```

The process can be extended to x86 (passing `-s arch=x86` in the command line), or to other configurations. For production usage, Conan **profiles** are highly recommended.

### 13.6.1 Using cmake-conan

The **cmake-conan** project in https://github.com/conan-io/cmake-conan is a CMake script that runs an `execute_process` that automatically launches **`conan install`** to install dependencies. The settings passed in the command line will be deduced from the current CMake configuration, that will match the Visual Studio one. This script can be used to further automate the installation task:

```
project(Example CXX)
cmake_minimum_required(VERSION 2.8.12)

# Download automatically, you can also just copy the conan.cmake file
if(NOT EXISTS "${CMAKE_BINARY_DIR}/conan.cmake")
message(STATUS "Downloading conan.cmake from https://github.com/conan-io/cmake-conan")
    file(DOWNLOAD "https://raw.githubusercontent.com/conan-io/cmake-conan/v0.9/conan.
↪cmake"
                  "${CMAKE_BINARY_DIR}/conan.cmake")
endif()

include(${CMAKE_BINARY_DIR}/conan.cmake)

conan_cmake_run(CONANFILE conanfile.txt
                BASIC_SETUP)

add_executable(example example.cpp)
target_link_libraries(example ${CONAN_LIBS})
```

This code will manage to download the **cmake-conan** CMake script, and use it automatically, calling a `conan install` automatically.

There could be an issue, though, for the `Release` configuration. Internally, the Visual Studio 2017 defines the `configurationType` As `RelWithDebInfo` for `Release` builds. But conan default settings (in the conan *settings.yml* file), only have `Debug` and `Release` defined. It is possible to modify the *settings.yml* file, and add those extra build types. Then you should create the `Hello` package for those settings. And most existing packages, specially in central repositories, are built only for Debug and Release modes.

An easier approach is to change the CMake configuration in Visual: go to the Menu -> CMake -> Change CMake Configuration. That should open the *CMakeSettings.json* file, and there you can change the `configurationType` to `Release`:

```
{
    "name": "x64-Release",
```

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```
    "generator": "Ninja",
    "configurationType": "Release",
    "inheritEnvironments": [ "msvc_x64_x64" ],
    "buildRoot": "${env.USERPROFILE}\\CMakeBuilds\\${workspaceHash}\\build\\${name}",
    "installRoot": "${env.USERPROFILE}\\CMakeBuilds\\${workspaceHash}\\install\\$
↪{name}",
    "cmakeCommandArgs": "",
    "buildCommandArgs": "-v",
    "ctestCommandArgs": ""
}
```

Note that the above CMake code is only valid for consuming existing packages. If you are also creating a package, you would need to make sure the right CMake code is executed, please check https://github.com/conan-io/cmake-conan/blob/master/README.md

### 13.6.2 Using tasks with tasks.vs.json

Another alternative is using file tasks feature of Visual Studio 2017. This way you can install dependencies by running **`conan install`** as task directly in the IDE.

All you need is to right click on your *conanfile.py*-> Configure Tasks (see the link above) and add the following to your *tasks.vs.json*.

**Warning:** The file *tasks.vs.json* is added to your local *.vs* folder so it is not supposed to be added to your version control system. There is also a feature request to improve this process.

```
{
    "tasks": [
        {
        "taskName": "conan install debug",
        "appliesTo": "conanfile.py",
        "type": "launch",
        "command": "${env.COMSPEC}",
        "args": [
            "conan install ${file} -s build_type=Debug -if C:/Users/user/CMakeBuilds/
↪4c2d87b9-ec5a-9a30-a47a-32ccb6cca172/build/x64-Debug/"
        ]
        },
        {
        "taskName": "conan install release",
        "appliesTo": "conanfile.py",
        "type": "launch",
        "command": "${env.COMSPEC}",
        "args": [
            "conan install ${file} -s build_type=Release -if C:/Users/user/
↪CMakeBuilds/4c2d87b9-ec5a-9a30-a47a-32ccb6cca172/build/x64-Release/"
        ]
        }
    ],
    "version": "0.2.1"
}
```

Then just right click on your *conanfile.py* and launch your **`conan install`** and regenerate your *CMakeLists.txt*.

## 13.7 How to manage C++ standard [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The setting representing the C++ standard is `cppstd`. The detected default profile doesn't set any value for the `cppstd` setting.

The consumer can specify it in a *profile* or with the `-s` parameter:

```
conan install . -s cppstd=gnu14
```

This setting will only be applied to the recipes specifying `cppstd` in the `settings` field:

```
class LibConan(ConanFile):
    name = "lib"
    version = "1.0"
    settings = "cppstd", "os", "compiler", "build_type", "arch"
```

Valid values for `compiler=Visual Studio`:

| VALUE | DESCRIPTION |
|---|---|
| 14 | C++ 14 |
| 17 | C++ 17 |
| 20 | C++ 20 (Still C++20 Working Draft) |

Valid values for other compilers:

| VALUE | DESCRIPTION |
|---|---|
| 98 | C++ 98 |
| gnu98 | C++ 98 with GNU extensions |
| 11 | C++ 11 |
| gnu11 | C++ 11 with GNU extensions |
| 14 | C++ 14 |
| gnu14 | C++ 14 with GNU extensions |
| 17 | C++ 17 |
| gnu17 | C++ 17 with GNU extensions |
| 20 | C++ 20 (Partial support) |
| gnu20 | C++ 20 with GNU extensions (Partial support) |

### 13.7.1 Build helpers

When the `cppstd` setting is declared in the recipe and the consumer specify a value for it:

- The *CMake* build helper will set the `CONAN_CMAKE_CXX_STANDARD` and `CONAN_CMAKE_CXX_EXTENSIONS` definitions, that will be converted to the corresponding CMake variables to activate the standard automatically with the `conan_basic_setup()` macro.
- The *AutotoolsBuildEnvironment* build helper will adjust the needed flag to `CXXFLAGS` automatically.
- The *MSBuild/VisualStudioBuildEnvironment* build helper will adjust the needed flag to `CL` env var automatically.

### 13.7.2 Package compatibility

By default Conan will detect the default standard of your compiler to not generate different binary packages. For example, you already built some `gcc > 6.1` packages, where the default std is `gnu14`. If you introduce the `cppstd` setting in your recipes and specify the `gnu14` value, Conan won't generate new packages, because it was already the default of your compiler.

**Note:** Check the *package_id()* reference to know more.

## 13.8 How to use docker to create and cross build C and C++ conan packages

With Docker, you can run different virtual Linux operating systems in a Linux, Mac OSX or Windows machine. It is useful to reproduce build environments, for example to automate CI processes. You can have different images with different compilers or toolchains and run containers every time is needed.

In this section you will find a *list of pre-built images* with common build tools and compilers as well as Conan installed.

### 13.8.1 Using conan inside a container

```
$ docker run -it --rm conanio/gcc7 /bin/bash
```

**Note:** Use `sudo` when needed to run `docker`.

The previous code will run a shell in container. We have specified:

- **`-it`**: Keep STDIN open and allocate a pseudo-tty, in other words, we want to type in the container because we are opening a bash.
- **`--rm`**: Once the container exits, remove the container. Helps to keep clean or hard drive.
- **`conanio/gcc7`**: Image name, check the *available docker images*.
- **`/bin/bash`**: The command to run

Now we are running on the conangcc7 container we can use Conan normally. In the following example we are creating a package from the recipe by cloning the repository, for OpenSSL. It is always recommended to upgrade conan from pip first:

```
$ sudo pip install conan --upgrade # We make sure we are running the latest Conan␣
↪version
$ git clone https://github.com/conan-community/conan-openssl
$ cd conan-openssl
$ conan create . user/channel
```

### 13.8.2 Sharing a local folder with a docker container

You can share a local folder with your container, for example a project:

```
$ git clone https://github.com/conan-community/conan-openssl
$ cd conan-openssl
$ docker run -it -v$(pwd):/home/conan/project --rm conanio/gcc7 /bin/bash
```

- `v$(pwd):/home/conan/project`: We are mapping the current directory (conan-openssl) to the container `/home/conan/project` directory, so anything we change in this shared folder, will be really changed in our host machine.

```
# Now we are running on the conangcc7 container
$ sudo pip install conan --upgrade # We make sure we are running the latest Conan␣
↪version
$ cd project
$ conan create . user/channel --build missing
$ conan remote add myremote http://some.remote.url
$ conan upload "*" -r myremote --all
```

### 13.8.3 Using the images to cross-build packages

You can use the *images* `-i386`, `-armv7` and `-armv7gh` to cross build conan packages.

The `armv7` images have a cross toolchain for linux ARM installed, and declared as main compiler with the environment variables `CC` and `CXX`. Also, the default Conan profile (`~/.conan/profiles/default`) is adjusted to declare the correct arch (`armv7` / `armv7hf`).

Cross-building and uploading a package along with all its missing dependencies for `Linux/armv7hf` is done in few steps:

```
$ git clone https://github.com/conan-community/conan-openssl
$ cd conan-openssl
$ docker run -it -v$(pwd):/home/conan/project --rm conanio/gcc49-armv7hf /bin/bash

# Now we are running on the conangcc49-armv7hf container
# The default profile is automatically adjusted to armv7hf
$ cat ~/.conan/profiles/default

[settings]
os=Linux
os_build=Linux
arch=armv7hf
arch_build=x86_64
compiler=gcc
compiler.version=4.9
compiler.libcxx=libstdc++
build_type=Release
[options]
[build_requires]
[env]

$ sudo pip install conan --upgrade # We make sure we are running the latest Conan␣
↪version
$ cd project

$ conan create . user/channel --build missing
$ conan remote add myremoteARMV7 http://some.remote.url
$ conan upload "*" -r myremoteARMV7 --all
```

### 13.8.4 Available docker images

**GCC** images

| Version | Target Arch |
|---|---|
| conanio/gcc49 (GCC 4.9) | x86_64 |
| conanio/gcc49-i386 (GCC 4.9) | x86 |
| conanio/gcc49-armv7 (GCC 4.9) | armv7 |
| conanio/gcc49-armv7hf (GCC 4.9) | armv7hf |
| conanio/gcc5-armv7 (GCC 5) | armv7 |
| conanio/gcc5-armv7hf (GCC 5) | armv7hf |
| conanio/gcc5 (GCC 5) | x86_64 |
| conanio/gcc5-i386 (GCC 5) | x86 |
| conanio/gcc5-armv7 (GCC 5) | armv7 |
| conanio/gcc5-armv7hf (GCC 5) | armv7hf |
| conanio/gcc6 (GCC 6) | x86_64 |
| conanio/gcc6-i386 (GCC 6) | x86 |
| conanio/gcc6-armv7 (GCC 6) | armv7 |
| conanio/gcc6-armv7hf: (GCC 6) | armv7hf |
| conanio/gcc7-i386 (GCC 7) | x86 |
| conanio/gcc7 (GCC 7) | x86_64 |
| conanio/gcc7-armv7 (GCC 7) | armv7 |
| conanio/gcc7-armv7hf (GCC 7) | armv7hf |

**Clang** images

| Version | Target Arch |
|---|---|
| conanio/clang38 (Clang 3.8) | x86_64 |
| conanio/clang39-i386 (Clang 3.9) | x86 |
| conanio/clang39 (Clang 3.9) | x86_64 |
| conanio/clang40-i386 (Clang 4) | x86 |
| conanio/clang40 (Clang 4) | x86_64 |
| conanio/clang50-i386 (Clang 5) | x86 |
| conanio/clang50 (Clang 5) | x86_64 |

The Dockerfiles for all these images can be found here.

## 13.9 How to reuse Python code in recipes

**Warning:** To reuse python code, from conan 1.7 there is a new `python_requires()` feature. See: *Python requires: reusing python code in recipes* This "how to" might be deprecated and removed in the future, it is left here for reference only.

First, if you feel that you are repeating a lot of Python code, and that repeated code could be useful for other Conan users, please propose it in a github issue.

There are several ways to handle Python code reuse in package recipes:

- To put common code in files, as explained *below*. This code has to be exported into the recipe itself.

- To create a Conan package with the common python code, and then `require` it from the recipe.

This howto explains the latter.

### 13.9.1 A basic Python package

Let's begin with a simple python package, a "hello world" functionality that we want to package and reuse:

```
def hello():
    print("Hello World from Python!")
```

To create a package, all we need to do is create the following layout:

```
-| hello.py
 | __init__.py
 | conanfile.py
```

The `__init__.py` is blank. It is not necessary to compile code, so the package recipe `conanfile.py` is quite simple:

```
from conans import ConanFile

class HelloPythonConan(ConanFile):
    name = "HelloPy"
    version = "0.1"
    exports = '*'
    build_policy = "missing"

    def package(self):
        self.copy('*.py')

    def package_info(self):
        self.env_info.PYTHONPATH.append(self.package_folder)
```

The `exports` will copy both the `hello.py` and the `__init__.py` into the recipe. The `package()` method is also obvious: to construct the package just copy the python sources.

The `package_info()` adds the current package folder to the `PYTHONPATH` conan environment variable. It will not affect the real environment variable unless the end user wants it.

It can be seen that this recipe would be practically the same for most python packages, so it could be factored in a `PythonConanFile` base class to further simplify it (open a feature request, or better a pull request :) )

With this recipe, all we have to do is:

```
$ conan export . memsharded/testing
```

Of course if you want to share the package with your team, you can **`conan upload`** it to a remote server. But to create and test the package, we can do everything locally.

Now the package is ready for consumption. In another folder, we can create a *conanfile.txt* (or a *conanfile.py* if we prefer):

```
[requires]
HelloPy/0.1@memsharded/testing
```

And install it with the following command:

```
$ conan install . -g virtualenv
```

Creating the above `conanfile.txt` might be unnecessary for this simple example, as you can directly run **`conan install HelloPy/0.1@memsharded/testing -g virtualenv`**, however, using the file is the canonical way.

The specified `virtualenv` generator will create an `activate` script (in Windows *activate.bat*), that basically contains the environment, in this case, the `PYTHONPATH`. Once we activate it, we are able to find the package in the path and use it:

```
$ activate
$ python
Python 2.7.12 (v2.7.12:d33e0cf91556, Jun 27 2016, 15:19:22) [MSC v.1500 32 bit␣
↪(Intel)] on win32
...
>>> import hello
>>> hello.hello()
Hello World from Python!
>>>
```

The above shows an interactive session, but you can import also the functionality in a regular python script.

### 13.9.2 Reusing python code in your recipes

#### Requiring a python conan package

As the conan recipes are python code itself, it is easy to reuse python packages in them. A basic recipe using the created package would be:

```
from conans import ConanFile

class HelloPythonReuseConan(ConanFile):
    requires = "HelloPy/0.1@memsharded/testing"

    def build(self):
        from hello import hello
        hello()
```

The `requires` section is just referencing the previously created package. The functionality of that package can be used in several methods of the recipe: `source()`, `build()`, `package()` and `package_info()`, i.e. all of the methods used for creating the package itself. Note that in other places it is not possible, as it would require the dependencies of the recipe to be already retrieved, and such dependencies cannot be retrieved until the basic evaluation of the recipe has been executed.

```
$ conan install .
...
$ conan build .
Hello World from Python!
```

#### Sharing a python module

Another approach is sharing a python module and exporting within the recipe.

Let's write for example a `msgs.py` file and put it besides the `conanfile.py`:

```
def build_msg(output):
    output.info("Building!")
```

And then the main `conanfile.py` would be:

```
from conans import ConanFile
from msgs import build_msg

class ConanFileToolsTest(ConanFile):
    name = "test"
    version = "1.9"
    exports = "msgs.py"  # Important to remember!

    def build(self):
        build_msg(self.output)
        # ...
```

It is important to note that such `msgs.py` file **must be exported** too when exporting the package, because package recipes must be self-contained.

The code reuse can also be done in the form of a base class, something like a file `base_conan.py`

```
from conans import ConanFile

class ConanBase(ConanFile):
    # common code here
```

And then:

```
from conans import ConanFile
from base_conan import ConanBase

class ConanFileToolsTest(ConanBase):
    name = "test"
    version = "1.9"
    exports = "base_conan.py"
```

## 13.10 How to create and share a custom generator with generator packages

There are several built-in generators, like `cmake`, `visual_studio`, `xcode`... But what if your build system is not included? Or maybe the existing built-in generators doesn't satisfy your needs. There are several options:

- Use the `txt` generator, that generates a plain text file easy to parse, which you might be able to use.
- Use `conanfile.py` data, and for example in the `build()` method, access that information directly and generate a file or call directly your system
- Fork the conan codebase and write a built-in generator. Please make a pull request if possible to contribute it to the community.
- Write a custom generator in a `conanfile.py` and manage it as a package. You can upload it to your own server and share with your team, or share with the world uploading it to bintray. You can manage it as a package, you can version it, overwrite it, delete it, create channels (testing/stable...), and the most important: bring it to your projects as a regular dependency.

This **how to** will show you how to do the latest one. We will build a generator for **premake** (https://premake.github.io/) build system:

### 13.10.1 Creating a custom generator

Basically a generator is a class that extends `Generator` and implements two properties: `filename`, which will be the name of the file that will be generated, and `content` with the contents of that file. The **name of the generator** itself will be taken from the class name:

```
class MyGeneratorName(Generator):
    @property
    def filename(self):
        return "mygenerator.file"

    @property
    def content(self):
        return "whatever contents the generator produces"
```

This class is just included in a `conanfile.py` that must contain also a `ConanFile` class that implements the package itself, with the name of the package, the version, etc. This class typically has no `source()`, `build()`, `package()`, and even the `package_info()` method is overridden as it doesn't have to define any include paths or library paths.

If you want to create a generator that creates more than one file, you can leave the `filename()` empty, and return a dictionary of filenames->contents in the `content()` method:

```
class MultiGenerator(Generator):

    @property
    def content(self):
        return {"filename1.txt": "contents of file1",
                "filename2.txt": "contents of file2"}  # any number of files

    @property
    def filename(self):
        pass
```

Once, it is defined in the `conanfile.py` you can treat is as a regular package, typically you will `export` it first to your local cache, test it, and once it is working fine, you would `upload` it to a server.

You have access to the `conanfile` instance at `self.conanfile` and get information from the requirements:

| Variable | Description |
|---|---|
| self.conanfile.deps_cpp_info | *deps_cpp_info* |
| self.conanfile.deps_env_info | *deps_env_info* |
| self.conanfile.deps_user_info | *deps_user_info* |
| self.conanfile.env | dict with the applied env vars declared in the requirements |

### 13.10.2 Premake generator example

Create a project (the best is a git repository):

```
$ mkdir conan-premake && cd conan-premake
```

Then, write in it the following **conanfile.py**:

```
from conans.model import Generator
from conans import ConanFile

class PremakeDeps(object):
    def __init__(self, deps_cpp_info):
        self.include_paths = ",\n".join('"%s"' % p.replace("\\", "/")
                                        for p in deps_cpp_info.include_paths)
        self.lib_paths = ",\n".join('"%s"' % p.replace("\\", "/")
                                    for p in deps_cpp_info.lib_paths)
        self.bin_paths = ",\n".join('"%s"' % p.replace("\\", "/")
                                    for p in deps_cpp_info.bin_paths)
        self.libs = ", ".join('"%s"' % p for p in deps_cpp_info.libs)
        self.defines = ", ".join('"%s"' % p for p in deps_cpp_info.defines)
        self.cppflags = ", ".join('"%s"' % p for p in deps_cpp_info.cppflags)
        self.cflags = ", ".join('"%s"' % p for p in deps_cpp_info.cflags)
        self.sharedlinkflags = ", ".join('"%s"' % p for p in deps_cpp_info.
↪sharedlinkflags)
        self.exelinkflags = ", ".join('"%s"' % p for p in deps_cpp_info.exelinkflags)

        self.rootpath = "%s" % deps_cpp_info.rootpath.replace("\\", "/")

class Premake(Generator):
    @property
    def filename(self):
        return "conanpremake.lua"

    @property
    def content(self):
        deps = PremakeDeps(self.deps_build_info)

        template = ('conan_includedirs{dep} = {{{deps.include_paths}}}\n'
                    'conan_libdirs{dep} = {{{deps.lib_paths}}}\n'
                    'conan_bindirs{dep} = {{{deps.bin_paths}}}\n'
                    'conan_libs{dep} = {{{deps.libs}}}\n'
                    'conan_cppdefines{dep} = {{{deps.defines}}}\n'
                    'conan_cppflags{dep} = {{{deps.cppflags}}}\n'
                    'conan_cflags{dep} = {{{deps.cflags}}}\n'
                    'conan_sharedlinkflags{dep} = {{{deps.sharedlinkflags}}}\n'
                    'conan_exelinkflags{dep} = {{{deps.exelinkflags}}}\n')

        sections = ["#!lua"]
        all_flags = template.format(dep="", deps=deps)
        sections.append(all_flags)
        template_deps = template + 'conan_rootpath{dep} = "{deps.rootpath}"\n'

        for dep_name, dep_cpp_info in self.deps_build_info.dependencies:
            deps = PremakeDeps(dep_cpp_info)
            dep_name = dep_name.replace("-", "_")
            dep_flags = template_deps.format(dep="_" + dep_name, deps=deps)
            sections.append(dep_flags)

        return "\n".join(sections)


class MyCustomGeneratorPackage(ConanFile):
    name = "PremakeGen"
    version = "0.1"
```

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```
    url = "https://github.com/memsharded/conan-premake"
    license = "MIT"

    def build(self):
        pass

    def package_info(self):
        self.cpp_info.includedirs = []
        self.cpp_info.libdirs = []
        self.cpp_info.bindirs = []
```

This is a full working example. Note the `PremakeDeps` class as a helper. The generator is creating premake information for each individual library separately, then also an aggregated information for all dependencies. This `PremakeDeps` wraps a single item of such information.

Note the **name of the package** will be **PremakeGen/0.1@user/channel** as that is the name given to it, while the generator name is **Premake**. You can give the package any name you want, even matching the generator name if desired.

You `export` the package recipe to the local cache, so it can be used by other projects as usual:

```
$ conan export memsharded/testing
```

### 13.10.3 Using the generator

Let's create a test project that uses this generator, and also an existing library conan package, we will use the simple "Hello World" package we already created before:

```
$ cd ..
$ mkdir premake-project && cd premake-project
```

Now put the following files inside. Note the `PremakeGen@0.1@memsharded/testing` package reference in conanfile.txt.

**conanfile.txt**

```
[requires]
Hello/0.1@memsharded/testing
PremakeGen@0.1@memsharded/testing

[generators]
Premake
```

**main.cpp**

```
#include "hello.h"

int main (void){
    hello();
}
```

**premake4.lua**

```
#!lua
```

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```
require 'conanpremake'

-- A solution contains projects, and defines the available configurations
solution "MyApplication"
   configurations { "Debug", "Release" }
   includedirs { conan_includedirs }
   libdirs { conan_libdirs }
   links { conan_libs }
   -- A project defines one build target
   project "MyApplication"
      kind "ConsoleApp"
      language "C++"
      files { "**.h", "**.cpp" }

      configuration "Debug"
         defines { "DEBUG" }
         flags { "Symbols" }

      configuration "Release"
         defines { "NDEBUG" }
         flags { "Optimize" }
```

Let's install the requirements and build the project:

```
$ conan install . -s compiler=gcc -s compiler.version=4.9 -s compiler.
↪libcxx=libstdc++ --build
$ premake4 gmake
$ make (or mingw32-make if in windows-mingw)
$ ./MyApplication
Hello World!
```

Now, everything works, so you might want to share your generator:

```
$ conan upload PremakeGen/0.1@memsharded/testing
```

**Note:** This is a regular conan package. You could for example embed this example in a *test_package* folder, create a *conanfile.py* that invokes premake4 in the build() method, and use **conan test** to automatically test your custom generator with a real project.

## 13.11 How to manage shared libraries

The shared libraries, *.DLL* in windows, *.dylib* in OSX and *.so* in Linux, are loaded at runtime, that means that the application executable needs to know where are the required shared libraries when it runs.

On Windows, the dynamic linker, will search in the same directory then in the *PATH* directories. On OSX, it will search in the directories declared in *DYLD_LIBRARY_PATH* as on Linux will use the *LD_LIBRARY_PATH*.

Furthermore in OSX and Linux there is another mechanism to locate the shared libraries: The RPATHs.

### 13.11.1 Manage Shared Libraries with Environment Variables

The shared libraries, are loaded at runtime. The application executable needs to know where to find the required shared libraries when it runs.

Depending on the operating system, we can use environment variables to help the dynamic linker to find the shared libraries:

| OPERATING SYSTEM | ENVIRONMENT VARIABLE |
|---|---|
| WINDOWS | PATH |
| LINUX | LD_LIBRARY_PATH |
| OSX | DYLD_LIBRARY_PATH |

If your package recipe (A) is generating shared libraries you can declare the needed environment variables pointing to the package directory. This way, any other package depending on (A) will automatically have the right environment variable set, so they will be able to locate the (A) shared library.

Similarly if you use the *virtualenv generator* and you activate it, you will get the paths needed to locate the shared libraries in your terminal.

#### Example

We are packaging a tool called `toolA` with a library and an executable that, for example, compress data.

The package offers two flavors, shared library or static library (embedded in the executable of the tool and available to link with). You can use the `toolA` package library to develop another executable or library or you can just use the executable provided by the package. In both cases, if you choose to install the *shared* package of `toolA` you will need to have the shared library available.

```
import os
from conans import tools, ConanFile

class ToolA(ConanFile):
    ....
    name = "toolA"
    version = "1.0"
    options = {"shared": [True, False]}
    default_options = {"shared": False}

    def build(self):
        # build your shared library

    def package(self):
        # Copy the executable
        self.copy(pattern="toolA*", dst="bin", keep_path=False)

        # Copy the libraries
        if self.options.shared:
            self.copy(pattern="*.dll", dst="bin", keep_path=False)
            self.copy(pattern="*.dylib", dst="lib", keep_path=False)
            self.copy(pattern="*.so*", dst="lib", keep_path=False)
        else:
            ...
```

### Using the tool from a different package

If we are creating now a package that uses the `ToolA` executable to compress some data. You can execute directly `toolA` using RunEnvironment build helper to set the environment variables accordingly:

```
import os
from conans import tools, ConanFile

class PackageB(ConanFile):
    name = "packageB"
    version = "1.0"
    requires = "toolA/1.0@myuser/stable"

    def build(self):
        exe_name = "toolA.exe" if self.settings.os == "Windows" else "toolA"
        self.run("%s --someparams" % exe_name, run_environment=True)
        ...
```

### Building an application using the shared library from `toolA`

As we are building a final application, probably we will want to distribute it together with the shared library from the `toolA`, so we can use the *Imports* to import the required shared libraries to our user space.

Listing 5: *conanfile.txt*

```
[requires]
toolA/1.0@myuser/stable

[generators]
cmake

[options]
toolA:shared=True

[imports]
bin, *.dll -> ./bin # Copies all dll files from packages bin folder to my "bin"␣
↪folder
lib, *.dylib* -> ./bin # Copies all dylib files from packages lib folder to my "bin"␣
↪folder
lib, *.so* -> ./bin # Copies all dylib files from packages lib folder to my "bin"␣
↪folder
```

Now you can build the project:

```
$ mkdir build && cd build
$ conan install ..
$ cmake .. -G "Visual Studio 14 Win64"
$ cmake --build . --config Release
$ cd bin && mytool
```

The previous example will work only in Windows and OSX (changing the CMake generator), because the dynamic linker will look in the current directory (the binary directory) where we copied the shared libraries too.

In Linux you still need to set the `LD_LIBRARY_PATH`, or in OSX, the `DYLD_LIBRARY_PATH`:

```
$ cd bin && LD_LIBRARY_PATH=$(pwd) && ./mytool
```

#### Using shared libraries from dependencies

If you are executing something that depends on shared libraries belonging to your dependencies, such shared libraries have to be found at runtime. In Windows, it is enough if the package added its binary folder to the system `PATH`. In Linux and OSX, it is necessary that the `LD_LIBRARY_PATH` and `DYLD_LIBRARY_PATH` environment variables are used.

Security restrictions might apply in OSX (read this thread), so the `DYLD_LIBRARY_PATH` environment variable is not directly transferred to the child process. In that case, you have to use it explicitly in your *conanfile.py*:

```
def test(self):
    # self.run('./myexe") # won't work, even if 'DYLD_LIBRARY_PATH' is in the env
    with tools.environment_append({"DYLD_LIBRARY_PATH": [self.deps_cpp_info["toolA"].
↪lib_paths]}):
        self.run('DYLD_LIBRARY_PATH=%s ./myexe" % os.environ['DYLD_LIBRARY_PATH'])
```

Or you could use `RunEnvironment` helper described above.

#### Using `virtualrunenv` generator

*virtualrunenv generator* will set the environment variables `PATH`, `LD_LIBRARY_PATH`, `DYLD_LIBRARY_PATH` pointing to *lib* and *bin* folders automatically.

Listing 6: *conanfile.txt*

```
[requires]
toolA/1.0@myuser/stable

[options]
toolA:shared=True

[generators]
virtualrunenv
```

In the terminal window:

```
$ conan install .
$ source activate_run
$ toolA --someparams
# Only For Mac OS users to avoid restrictions:
$ DYLD_LIBRARY_PATH=$DYLD_LIBRARY_PATH toolA --someparams
```

### 13.11.2 Manage RPATHs

The **rpath** is encoded inside dynamic libraries and executables and helps the linker to find its required shared libraries.

If we have an executable, **my_exe**, that requires a shared library, **shared_lib_1**, and **shared_lib_1**, in turn, requires another **shared_lib_2**.

So the **rpaths** values are:

| File | rpath |
|---|---|
| my_exe | /path/to/shared_lib_1 |
| shared_lib_1 | /path/to/shared_lib_2 |
| shared_lib_2 | |

In **linux** if the linker doesn't find the library in **rpath**, it will continue the search in **system defaults paths** (LD_LIBRARY_PATH... etc) In OSX, if the linker detects an invalid **rpath** (the file does not exist there), it will fail.

### Default Conan approach

The consumer project of dependencies with shared libraries needs to import them to the executable directory to be able to run it:

**conanfile.txt**

```
[requires]
Poco/1.9.0@pocoproject/stable

[imports]
bin, *.dll -> ./bin # Copies all dll files from packages bin folder to my "bin" folder
lib, *.dylib* -> ./bin # Copies all dylib files from packages lib folder to my "bin"␣
↪folder
```

On **Windows** this approach works well, importing the shared library to the directory containing your executable is a very common procedure.

On **Linux** there is an additional problem, the dynamic linker doesn't look by default in the executable directory, and you will need to adjust the *LD_LIBRARY_PATH* environment variable like this:

```
LD_LIBRARY_PATH=$(pwd) && ./mybin
```

On **OSX** if absolute rpaths are hardcoded in an executable or shared library and they don't exist the executable will fail to run. This is the most common problem when we reuse packages in a different environment from where the artifacts have been generated.

So, for **OSX**, conan, by default when you build your library with **CMake**, the rpaths will be generated without any path:

| File | rpath |
|---|---|
| my_exe | shared_lib_1.dylib |
| shared_lib_1.dylib | shared_lib_2.dylib |
| shared_lib_2.dylib | |

The `conan_basic_setup()` macro will set the `set(CMAKE_SKIP_RPATH 1)` in OSX.

You can skip this default behavior by passing the `KEEP_RPATHS` parameter to the `conan_basic_setup` macro:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup(KEEP_RPATHS)

add_executable(timer timer.cpp)
target_link_libraries(timer ${CONAN_LIBS})
```

If you are using `autotools` conan won't auto-adjust the rpaths behavior, if you want to follow this default behavior probably you will need to replace the `install_name` in the **configure** or **MakeFile** generated files in your recipe to not use $rpath:

```
replace_in_file("./configure", r"-install_name \$rpath/", "-install_name ")
```

### Different approaches

You can adjust the **rpaths** in the way that adapts better to your needs.

If you are using `CMake` take a look to the CMake RPATH handling guide.

Remember to pass the `KEEP_RPATHS` variable to the `conan_basic_setup`:

```
include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
conan_basic_setup(KEEP_RPATHS)
```

Then, you could, for example, use the `@executable_path` in OSX and `$ORIGIN` in Linux to adjust a relative path from the executable:

```
if (APPLE)
    set(CMAKE_INSTALL_RPATH "@executable_path/../lib")
else()
    set(CMAKE_INSTALL_RPATH "$ORIGIN/../lib")
endif()
```

You can use this imports statements in the consumer project:

```
[requires]
Poco/1.9.0@pocoproject/stable

[imports]
bin, *.dll -> ./bin # Copies all dll files from packages bin folder to my "bin" folder
lib, *.dylib* -> ./lib # Copies all dylib files from packages lib folder to my "lib"␣
↪folder
lib, *.so* -> ./lib # Copies all so files from packages lib folder to my "lib" folder
```

And your finally application can follow this layout:

```
bin
 |_____ my_executable
 |_____ mylib.dll
 |
lib
 |_____ libmylib.so
 |_____ libmylib.dylib
```

You could move the entire application folder to any location and the shared libraries will be located correctly.

## 13.12 How to reuse cmake install for package() method

It is possible that your project's *CMakeLists.txt* has already defined some functionality that extracts the artifacts (headers, libraries, binaries) from the build and source folder to a predetermined place and does the post-processing (*e.g.*, strips rpaths). For example, one common practice is to use CMake install directive to that end.

When using Conan, the install phase of CMake is wrapped in the `package()` method.

The following excerpt shows how to build and package with CMake within Conan. Mind that you need to configure CMake both in `build()` and in `package()` since these methods are called independently.

```
def configure_cmake(self):
    cmake = CMake(self)
```

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```
    cmake.definitions["SOME_DEFINITION"] = True
    cmake.configure()

    return cmake

def build(self):
    cmake = self.configure_cmake()
    cmake.build()

def package(self):
    cmake = self.configure_cmake()
    cmake.install()

def package_info(self):
    self.cpp_info.libs = ["libname"]
```

The `package_info()` method specifies the list of the necessary libraries, defines and flags for different build configurations for the consumers of the package. This is necessary as there is no possible way to extract this information from the CMake install automatically.

---

**Important:** Please mind that if you use `cmake.install()` in `package()`, it will be called twice if you are using *no_copy_source* attribute in your conanfile.

CMake usually uses `install` directive to package both the artifacts and source code (*i.e.* header files) into the package folder. Hence calling `package()` twice, while having no side effects, is wasting a couple of cycles, since source code is already copied in the first invocation of `package()` and the install step will be done twice. Files will be simply overwritten, but install steps are sometimes time-expensive and this doubles the "packaging" time.

This might be unintuitive if you only use CMake, but mind that Conan needs to cater to many different build systems and scenarios (*e.g.* where you don't control the CMake configuration directly) and hence this workflow is indispensable.

---

## 13.13 How to collaborate on other users' packages

If a certain existing package does not work for you, or you need to store pre-compiled binaries for a platform not provided by the original package creator, you might still be able to do so:

### 13.13.1 Collaborate from source repository

If the original package creator has the package recipe in a repository, this would be the simplest approach. Just clone the package recipe in your machine, change something if you want, and then export the package recipe under your own user name. Point your project's `[requires]` to the new package name, and use it as usual:

```
$ git clone <repository>
$ cd <repository>
//make changes if desired
$ conan export . <youruser/yourchannel>
```

You can just directly run:

```
$ conan create . demo/testing
```

Once you have generated the desired binaries, you can store your pre-compiled binaries in your bintray repository or in your own Conan server:

```
$ conan upload Package/0.1@myuser/stable -r=myremote --all
```

Finally, if you made useful changes, you might want to create a pull request to the original repository of the package creator.

### 13.13.2 Copy a package

If you don't need to modify the original package creator recipe, it is fine to just copy the package in your local storage. You can copy the recipes and existing binary packages. This could be enough for caching existing binary packages from the original remote into your own remote, under your own username:

```
$ conan copy Poco/1.7.8p3@pocoproject/stable myuser/testing
$ conan upload Poco/1.7.8p3@myuser/testing -r=myremote --all
```

## 13.14 How to link with Apple Frameworks

It is common in macOS that your conan package needs to link with a complete Apple framework, and, of course, you want to propagate this information to all projects/libraries that uses your package.

With regular libraries we use `self.cpp_info.libs` object to append to it all the libraries:

```
def package_info(self):

    self.cpp_info.libs = ["SDL2"]
    self.cpp_info.libs.append("OpenGL32")
```

With frameworks we need to declare the "-framework flag" as a linker flag:

```
def package_info(self):

    self.cpp_info.libs = ["SDL2"]

    self.cpp_info.exelinkflags.append("-framework Carbon")
    self.cpp_info.exelinkflags.append("-framework CoreAudio")
    self.cpp_info.exelinkflags.append("-framework Security")
    self.cpp_info.exelinkflags.append("-framework IOKit")

    self.cpp_info.sharedlinkflags = self.cpp_info.exelinkflags
```

In the previous example we are using `self.cpp_info.exelinkflags`. If we are using CMake to consume this package, it will only link those frameworks if we are building an executable and `sharedlinkflags` will only apply if we are building a shared library.

If we are not using CMake to consume this package `sharedlinkflags` and `exelinkflags` are used indistinctly. In the example above we are assigning in the last line `sharedlinkflags` with `exelinkflags`, so no matter what the consumer will build, it will indicate to the linker to link with the specified frameworks.

## 13.15 How to package Apple Frameworks

To package a **MyFramework** Apple framework, copy/create a folder `MyFramework.framework` to your package folder, where you should put all the subdirectories (`Headers`, `Modules`, etc).

```
def package(self):
    # If you have the framework folder built in your build_folder:
    self.copy("MyFramework.framework/*", symlinks=True)
    # Or build the destination folder:
    tools.mkdir("MyFramework.framework/Headers")
    self.copy("*.h", dst="MyFramework.framework/Headers")
    # ...
```

Declare the framework in the `cpp_info` object, passing a compiler flag `-F` with the directory of the framework folder (self.package_folder) and linker flags with the `-F` and `-framework` with the framework name.

```
def package_info(self):
    ...
    # Note that -F flags are not automatically adjusted in "cmake"
    # generator so it will be needed to declare its path like this:
    # self.cpp_info.exelinkflags.append("-F path/to/the/framework -framework␣
↪MyFramework")

    f_location = '-F "%s"' % self.package_folder
    self.cpp_info.cflags.append(f_location) # or cpp_info.cppflags if cpp library
    self.cpp_info.sharedlinkflags.extend([f_location, "-framework MyFramework"])
    self.cpp_info.exelinkflags = self.cpp_info.sharedlinkflags
```

## 13.16 How to collect licenses of dependencies

With the `imports` feature it is possible to collect the License files from all packages in the dependency graph. Please note that the licenses are artifacts that must exist in the binary packages to be collected, as different binary packages might have different licenses. E.g., A package creator might provide a different license for static or shared linkage with different "License" files if they want to.

Also, we will assume the convention that the package authors will provide a "License" (case not important) file at the root of their packages.

In *conanfile.txt* we would use the following syntax:

```
[imports]
., license* -> ./licenses @ folder=True, ignore_case=True
```

And in *conanfile.py* we will use the `imports()` method:

```
def imports(self):
     self.copy("license*", dst="licenses", folder=True, ignore_case=True)
```

In both cases, after **`conan install`**, it will store all the found License files inside the local **licenses** folder, which will contain one subfolder per dependency with the license file inside.

## 13.17 How to capture package version from SCM: git

The `Git()` helper from tools, can be used to capture data from the Git repo in which the *conanfile.py* recipe resides, and use it to define the version of the Conan package.

```
from conans import ConanFile, tools

def get_version():
    git = tools.Git()
    try:
        return "%s_%s" % (git.get_branch(), git.get_revision())
    except:
        return None

class HelloConan(ConanFile):
    name = "Hello"
    version = get_version()

    def build(self):
        ...
```

In this example, the package created with **conan create** will be called `Hello/branch_commit@user/channel`. Note that `get_version()` returns `None` if it is not able to get the Git data. This is necessary when the recipe is already in the Conan cache, and the Git repository may not be there,. A value of `None` makes Conan get the version from the metadata.

## 13.18 How to capture package version from SCM: svn

The `SVN()` helper from tools, can be used to capture data from the subversion repo in which the *conanfile.py* recipe resides, and use it to define the version of the Conan package.

```
from conans import ConanFile, tools

def get_svn_version(version):
    try:
        scm = tools.SVN()
        revision = scm.get_revision()
        branch = scm.get_branch() # Delivers e.g trunk, tags/v1.0.0, branches/my_
↪branch
        branch = branch.replace("/","_")
        if scm.is_pristine():
            dirty = ""
        else:
            dirty = ".dirty"
        return "%s-%s+%s%s" % (version, revision, branch, dirty) # e.g. 1.2.0-
↪1234+trunk.dirty
    except Exception:
        return None

class HelloLibrary(ConanFile):
    name = "Hello"
    version = get_svn_version("1.2.0")

    def build(self):
        ...
```

In this example, the package created with **conan create** will be called `Hello/generated_version@user/channel`. Note that `get_svn_version()` returns `None` if it is not able to get the subversion data. This is necessary when the recipe is already in the Conan cache, and the subversion repository may not be there. A value of `None` makes Conan get the version from the metadata.

## 13.19 How to capture package version from text or build files

It is common that a library version number would be already encoded in a text file, build scripts, etc. As an example, let's assume we have the following library layout, and that we want to create a package from it:

```
conanfile.py
CMakeLists.txt
src
   hello.cpp
   ...
```

The *CMakeLists.txt* will have some variables to define the library version number. For simplicity, let's also assume that it includes a line such as the following:

```
cmake_minimum_required(VERSION 2.8)
set(MY_LIBRARY_VERSION 1.2.3) # This is the version we want
add_library(hello src/hello.cpp)
```

Typically, our *conanfile.py* package recipe will include:

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "1.2.3"
```

This usually requires very little maintenance, and when the CMakeLists version is bumped, so is the *conanfile.py* version. However, if you only want to have to update the *CMakeLists.txt* version, you can extract the version dynamically, using:

```
from conans import ConanFile
from conans.tools import load
import re

def get_version():
    try:
        content = load("CMakeLists.txt")
        version = re.search(b"set\(MY_LIBRARY_VERSION (.*)\)", content).group(1)
        return version.strip()
    except Exception as e:
        return None

class HelloConan(ConanFile):
    name = "Hello"
    version = get_version()
```

Even if the *CMakeLists.txt* file is not exported to the local cache, it will still work, as the `get_version()` function returns None when it is not found, and then takes the version number from the package metadata (layout).

## 13.20 How to use Conan as other language package manager

Conan is a generic package manager. In the *getting started* section we saw how to use conan and manage a C/C++ library, like POCO.

But conan just provided some tools, related with C/C++ (like some generators and the cpp_info), to offer a better user experience. The general basis of Conan can be used with other programming languages.

Obviously, this does not try to compete with other package managers. Conan is a C and C++ package manager, focused on C and C++ developers. But when we realized that this was possible, we thought it was a good way to showcase its power, simplicity and versatility.

And of course, if you are doing C/C++ and occasionally you need some package from other language in your workflow, as in the conan package recipes themselves, or for some other tooling, you might find this functionality useful.

### 13.20.1 Conan: A Go package manager

#### The source code

You can just clone the following example repository:

```
$ git clone https://github.com/conan-community/conan-goserver-example
```

Or, alternatively, manually create the folder and copy the following files inside:

```
$ mkdir conan-goserver-example
$ cd conan-goserver-example
$ mkdir src
$ mkdir src/server
```

The files are:

*src/server/main.go* is a small http server that will answer "Hello world!" if we connect to it.

```
package main

import "github.com/go-martini/martini"

func main() {
  m := martini.Classic()
  m.Get("/", func() string {
    return "Hello world!"
  })
  m.Run()
}
```

#### Declaring and installing dependencies

Create a *conanfile.txt*, with the following content:

Listing 7: *conanfile.txt*

```
 [requires]
 go-martini/1.0@lasote/stable

```

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```
[imports]
src, * -> ./deps/src
```

Our project requires a package, **go-martini/1.0@lasote/stable**, and we indicate that all **src contents** from all our requirements have to be copied to *./deps/src*.

The package go-martini depends on go-inject, so Conan will handle automatically the go-inject dependency.

```
$ conan install .
```

This command will download our packages and will copy the contents in the *./deps/src* folder.

### Running our server

Just add the **deps** folder to `GOPATH`:

```
# Linux / Macos
$ export GOPATH=${GOPATH}:${PWD}/deps

# Windows
$ SET GOPATH=%GOPATH%;%CD%/deps
```

And run the server:

```
$ cd src/server
$ go run main.go
```

Open your browser and go to *localhost:9300*

```
Hello World!
```

### Generating Go packages

Creating a Conan package for a Go library is very simple. In a Go project, you compile all the code from sources in the project itself, including all of its dependencies.

So we don't need to take care of settings at all. Architecture, compiler, operating system, etc. are only relevant for pre-compiled binaries. Source code packages are settings agnostic.

Let's take a look at the *conanfile.py* of the **go inject** library:

Listing 8: *conanfile.py*

```
from conans import ConanFile

class InjectConan(ConanFile):
    name = "go-inject"
    version = "1.0"

    def source(self):
        self.run("git clone https://github.com/codegangsta/inject.git")
        self.run("cd inject && git checkout v1.0-rc1")  # TAG v1.0-rc1

    def package(self):
        self.copy(pattern='*', dst='src/github.com/codegangsta/inject', src="inject",
↪ keep_path=True)
```

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If you have read the *Building a hello world package*, the previous code may look quite simple to you.

We want to pack **version 1.0** of the **go inject** library, so the **version** variable is **"1.0"**. In the `source()` method, we declare how to obtain the source code of the library, in this case just by cloning the github repository and making a checkout of the **v1.0-rc1** tag. In the `package()` method, we are just copying all the sources to a folder named "src/github.com/codegangsta/inject".

This way, we can keep importing the library in the same way:

```
import "github.com/codegangsta/inject"
```

We can export and upload the package to a remote and we are done:

```
$ conan export . lasote/stable  # Or any other user/channel
$ conan upload go-inject/1.0@lasote/stable --all
```

Now look at the **go martini** conanfile:

Listing 9: *conanfile.py*

```
from conans import ConanFile

class InjectConan(ConanFile):
    name = "go-martini"
    version = "1.0"
    requires = 'go-inject/1.0@lasote/stable'

    def source(self):
        self.run("git clone https://github.com/go-martini/martini.git")
        self.run("cd martini && git checkout v1.0")  # TAG v1.0

    def package(self):
        self.copy(pattern='*', dst='src/github.com/go-martini/martini', src="martini
↪", keep_path=True)
```

It is very similar. The only difference is the `requires` variable. It defines the **go-inject/1.0@lasote/stable** library, as a requirement.

```
$ conan export . lasote/stable  # Or any other user/channel
$ conan upload go-martini/1.0@lasote/stable  --all
```

Now we are able to use them easily and without the problems of versioning with github checkouts.

### 13.20.2 Conan: A Python package manager

Conan is a C and C++ package manager, and to deal with the vast variability of C and C++ build systems, compilers, configurations, etc., it was designed to be extremely flexible, to allow users the freedom to configure builds in virtually any manner required. This is one of the reasons to use Python as the scripting language for Conan package recipes.

With this flexibility, Conan is able to do very different tasks: package Visual Studio modules, *package Go code*, build packages from sources or from binaries retrieved from elsewhere, etc.

*Python code can be reused and packaged with Conan* to share functionalities or tools among *conanfile.py* files. Here we can see a full example of Conan as a Python package manager.

### A full Python and C/C++ package manager

The real utility of this is that Conan is a C and C++ package manager. So, for example, you are able to create a Python package that wraps the functionality of the Poco C++ library. Poco itself has transitive (C/C++) dependencies, but they are already handled by Conan. Furthermore, a very interesting thing is that nothing has to be done in advance for that library, thanks to useful tools such as **pybind11**, that lets you easily create Python bindings.

So let's build a package with the following files:

- *conanfile.py*: The package recipe.
- *__init__.py*: A required file which should remain blank.
- *pypoco.cpp*: The C++ code with the `pybind11` wrapper for Poco that generates a Python extension (a shared library that can be imported from Python).
- *CMakeLists.txt*: The CMake build file that is able to compile *pypoco.cpp* into a Python extension (*pypoco.pyd* in Windows, *pypoco.so* in Linux)
- *poco.py*: A Python file that makes use of the pypoco Python binary extension built with *pypoco.cpp*.
- *test_package/conanfile.py*: A test consumer "convenience" recipe to create and test the package.

The *pypoco.cpp* file can be coded easily thanks to the elegant `pybind11` library:

Listing 10: pypoco.cpp

```
#include <pybind11/pybind11.h>
#include "Poco/Random.h"

using Poco::Random;
namespace py = pybind11;

PYBIND11_PLUGIN(pypoco) {
    py::module m("pypoco", "pybind11 example plugin");
    py::class_<Random>(m, "Random")
        .def(py::init<>())
        .def("nextFloat", &Random::nextFloat);
    return m.ptr();
}
```

And the *poco.py* file is straightforward:

Listing 11: *poco.py*

```
import sys
import pypoco

def random_float():
    r = pypoco.Random()
    return r.nextFloat()
```

The *conanfile.py* is a bit longer, but is still quite easy to understand:

Listing 12: *conanfile.py*

```
from conans import ConanFile, tools, CMake

class PocoPyReuseConan(ConanFile):
    name = "PocoPy"
```

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```
    version = "0.1"
    requires = "Poco/1.9.0@pocoproject/stable", "pybind11/any@memsharded/stable"
    settings = "os", "compiler", "arch", "build_type"
    exports = "*"
    generators = "cmake"
    build_policy = "missing"

    def build(self):
        cmake = CMake(self)
        pythonpaths = "-DPYTHON_INCLUDE_DIR=C:/Python27/include -DPYTHON_LIBRARY=C:/
↪Python27/libs/python27.lib"
        self.run('cmake %s %s -DEXAMPLE_PYTHON_VERSION=2.7' % (cmake.command_line,␣
↪pythonpaths))
        self.run("cmake --build . %s" % cmake.build_config)

    def package(self):
        self.copy('*.py*')
        self.copy("*.so")

    def package_info(self):
        self.env_info.PYTHONPATH.append(self.package_folder)
```

The recipe now declares 2 `requires` that we will be used to create the binary extension: the **Poco library** and the **pybind11 library**.

As we are actually building C++ code, there are a few important things that we need:

- Input `settings` that define the OS, compiler, version and architecture we are using to build our extension. This is necessary because the binary we are building must match the architecture of the Python interpreter that we will be using.
- The `build()` method is actually used to invoke CMake. You may see that we had to hardcode the Python path in the example, as the *CMakeLists.txt* call to `find_package(PythonLibs)` didn't find my Python installation in *C:/Python27*, even though that is a standard path. I have also added the `cmake` generator to be able to easily use the declared `requires` build information inside my *CMakeLists.txt*.
- The *CMakeLists.txt* is not posted here, but is basically the one used in the pybind11 example with just 2 lines to include the cmake file generated by Conan for dependencies. It can be inspected in the GitHub repo.
- Note that we are using Python 2.7 as an input option. If necessary, more options for other interpreters/architectures could be easily provided, as well as avoiding the hardcoded paths. Even the Python interpreter itself could be packaged in a Conan package.

The above recipe will generate a different binary for different compilers or versions. As the binary is being wrapped by Python, we could avoid this and use the same binary for different setups, modifying this behavior with the `conan_info()` method.

```
$ conan export . memsharded/testing
$ conan install PocoPy/0.1@memsharded/testing -s arch=x86 -g virtualenv
$ activate
$ python
>>> import poco
>>> poco.random_float()
0.697845458984375
```

Now, the first invocation of **`conan install`** will retrieve the dependencies and build the package. The next invocation will use the cached binaries and be much faster. Note how we have to specify `-s arch=x86` to match the architecture of the Python interpreter to be used, in our case, 32 bits.

The output of the **conan install** command also shows us the dependencies that are being pulled:

```
Requirements
    OpenSSL/1.0.2l@conan/stable from conan.io
    Poco/1.9.0@pocoproject/stable from conan.io
    PocoPy/0.1@memsharded/testing from local
    pybind11/any@memsharded/stable from conan.io
    zlib/1.2.11@conan/stable from conan.io
```

This is one of the great advantages of using Conan for this task, because by depending on Poco, other C and C++ transitive dependencies are retrieved and used in the application.

For a deeper look into the code of these examples, please refer to this github repo. The above examples and code have only been tested on Win10, VS14u2, but may work on other configurations with little or no extra work.

## 13.21 How to manage SSL (TLS) certificates

### 13.21.1 Server certificate validation

By default, when a remote is added, if the URL schema is `https`, the Conan client will verify the certificate using a list of authorities declared in the `cacert.pem` file located in the conan home (~/.conan).

If you have a self signed certificate (not signed by any authority) you have two options:

- Use the *conan remote* command to disable the SSL verification.
- Append your server `crt` file to the `cacert.pem` file.

### 13.21.2 Client certificates

If your server is requiring client certificates to validate a connection from a Conan client, you need to create two files in the conan home directory (default ~/.conan):

- A file `client.crt` with the client certificate.
- A file `client.key` with the private key.

---

**Note:** You can create only the `client.crt` file containing both the certificate and the private key concatenated and not create the `client.key`

If you are a familiar with the curl tool, this mechanism is similar to specify the `--cert` / `--key` parameters.

---

## 13.22 How to check the version of the Conan client inside a conanfile

Sometimes it might be useful to check the Conan version that is running in that moment your recipe. Although we consider conan-center recipes only forward compatible, this kind of check makes sense to update them so they can maintain compatibility with old versions of Conan.

Let's have a look at a basic example of this:

Listing 13: conanfile.py

```
from conans import ConanFile, CMake, __version__ as conan_version
from conans.model.version import Version


class MyLibraryConan(ConanFile):
    name = "mylibrary"
    version = "1.0"

    def build(self):
        if conan_version < Version("0.29"):
            cmake = CMake(self.settings)
        else:
            cmake = CMake(self)
    ...
```

Here it checks the Conan version to maintain compatibility of the CMake build helper for versions lower than Conan 0.29. It also uses the internal `Version()` class to perform the semver comparison in the if clause.

You can find a real example of this in the mingw_installer. Here you have the interesting part of the recipe:

Listing 14: conanfile.py

```
from conans import ConanFile, tools, __version__ as conan_version
from conans.model.version import Version


class MingwInstallerConan(ConanFile):
    name = "mingw_installer"
    version = "1.0"
    license = "http://www.mingw.org/license"
    url = "http://github.com/conan-community/conan-mingw-installer"

    if conan_version < Version("0.99"):
        os_name = "os"
        arch_name = "arch"
    else:
        os_name = "os_build"
        arch_name = "arch_build"

    settings = {os_name: ["Windows"],
                arch_name: ["x86", "x86_64"],
                "compiler": {"gcc": {"version": None,
                                     "libcxx": ["libstdc++", "libstdc++11"],
                                     "threads": ["posix", "win32"],
                                     "exception": ["dwarf2", "sjlj", "seh"]}}}
    ...
```

You can see here the `mingw_installer` recipe uses new settings `os_build` and `arch_build` since Conan 1.0 as those are the right ones for *installer packages*. However, it also keeps the old settings so as not to break the recipe for old version, using normal `os` and `arch`.

As said before, this is useful to maintain compatibility of recipes with older Conan versions but remember that since Conan 1.0 there should not be *any breaking changes*.

## 13.23 Use a generic CI with Conan and Artifactory

### 13.23.1 Uploading the BuildInfo

If you are using *Jenkins with Conan and Artifactory*, with the Jenkins Artifactory Plugin, any Conan package downloaded or uploaded during your build will be automatically recorded in the BuildInfo json file, that will be automatically uploaded to the specified Artifactory instance.

However, you can gather and upload that information using other CI infrastructure with the following steps:

1. Before calling Conan the first time in your build, set the environment variable *CONAN_TRACE_FILE* to a file path. The generated file will contain the BuildInfo json.
2. You also need to create the *artifacts.properties* file in your Conan home containing the build information. All this properties will be automatically associated to all the published artifacts.

```
artifact_property_build.name=MyBuild
artifact_property_build.number=23
artifact_property_build.timestamp=1487676992
```

3. Call Conan as many times as you need. For example, if you are testing a Conan package and uploading it at the end, you will run something similar to:

```
$ conan create . user/stable # Will retrieve the dependencies and create the package
$ conan upload mypackage/1.0@user/stable -r artifactory
```

4. Call the command *conan_build_info* passing the path to the generated conan traces file and a parameter `--output` to indicate the output file. You can also, delete the traces.log‘ file‘ otherwise while the *CONAN_TRACE_FILE* is present, any Conan command will keep appending actions.

```
$ conan_build_info /tmp/traces.log --output /tmp/build_info.json
$ rm /tmp/traces.log
```

5. Edit the *build_info.json* file to append `name` (build name), `number` (build number) and the `started` (started date) and any other field that you need according to the Build Info json format.

   The `started` field has to be in the format: `yyyy-MM-dd'T'HH:mm:ss.SSSZ`

   To edit the file you can import the json file using the programming language you are using in your framework, groovy, java, python...

6. Push the json file to Artifactory, using the REST-API:

```
curl -X PUT -u<username>:<password> -H "Content-type: application/json" -T /tmp/build_
↪info.json "http://host:8081/artifactory/api/build"
```

CHAPTER

# FOURTEEN

# REFERENCE

General information about the commands, configuration files, etc.

Contents:

## 14.1 Commands

### 14.1.1 Consumer commands

Commands related with the installation and usage of Conan packages:

#### conan install

```
$ conan install [-h] [-g GENERATOR] [-if INSTALL_FOLDER] [-m [MANIFESTS]]
                [-mi [MANIFESTS_INTERACTIVE]] [-v [VERIFY]]
                [--no-imports] [-j JSON] [-b [BUILD]] [-e ENV]
                [-o OPTIONS] [-pr PROFILE] [-r REMOTE] [-s SETTINGS] [-u]
                path_or_reference
```

Installs the requirements specified in a recipe (conanfile.py or conanfile.txt). It can also be used to install a concrete package specifying a reference. If any requirement is not found in the local cache, it will retrieve the recipe from a remote, looking for it sequentially in the configured remotes. When the recipes have been downloaded it will try to download a binary package matching the specified settings, only from the remote from which the recipe was retrieved. If no binary package is found, it can be build from sources using the '–build' option. When the package is installed, Conan will write the files for the specified generators.

```
positional arguments:
  path_or_reference     Path to a folder containing a recipe (conanfile.py or
                        conanfile.txt) or to a recipe file. e.g.,
                        ./my_project/conanfile.txt. It could also be a
                        reference

optional arguments:
  -h, --help            show this help message and exit
  -g GENERATOR, --generator GENERATOR
                        Generators to use
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Use this directory as the directory where to put the
                        generatorfiles. e.g., conaninfo/conanbuildinfo.txt
  -m [MANIFESTS], --manifests [MANIFESTS]
                        Install dependencies manifests in folder for later
```

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```
                      verify. Default folder is .conan_manifests, but can be
                      changed
-mi [MANIFESTS_INTERACTIVE], --manifests-interactive [MANIFESTS_INTERACTIVE]
                      Install dependencies manifests in folder for later
                      verify, asking user for confirmation. Default folder
                      is .conan_manifests, but can be changed
-v [VERIFY], --verify [VERIFY]
                      Verify dependencies manifests against stored ones
--no-imports          Install specified packages but avoid running imports
-j JSON, --json JSON  Path to a json file where the install information will
                      be written
-b [BUILD], --build [BUILD]
                      Optional, use it to choose if you want to build from
                      sources: --build Build all from sources, do not use
                      binary packages. --build=never Never build, use binary
                      packages or fail if a binary package is not found.
                      --build=missing Build from code if a binary package is
                      not found. --build=outdated Build from code if the
                      binary is not built with the current recipe or when
                      missing binary package. --build=[pattern] Build always
                      these packages from source, but never build the
                      others. Allows multiple --build parameters. 'pattern'
                      is a fnmatch file pattern of a package name. Default
                      behavior: If you don't specify anything, it will be
                      similar to '--build=never', but package recipes can
                      override it with their 'build_policy' attribute in the
                      conanfile.py.
-e ENV, --env ENV     Environment variables that will be set during the
                      package build, -e CXX=/usr/bin/clang++
-o OPTIONS, --options OPTIONS
                      Define options values, e.g., -o Pkg:with_qt=true
-pr PROFILE, --profile PROFILE
                      Apply the specified profile to the install command
-r REMOTE, --remote REMOTE
                      Look in the specified remote server
-s SETTINGS, --settings SETTINGS
                      Settings to build the package, overwriting the
                      defaults. e.g., -s compiler=gcc
-u, --update          Check updates exist from upstream remotes
```

**conan install** executes methods of a *conanfile.py* in the following order:

1. `config_options()`
2. `configure()`
3. `requirements()`
4. `package_id()`
5. `package_info()`
6. `deploy()`

Note this describes the process of installing a pre-built binary package. If the package has to be built, **conan install --build** executes the following:

1. `config_options()`
2. `configure()`

3. `requirements()`
4. `package_id()`
5. `build_requirements()`
6. `build_id()`
7. `system_requirements()`
8. `source()`
9. `imports()`
10. `build()`
11. `package()`
12. `package_info()`
13. `deploy()`

**Examples**

- Install a package requirement from a `conanfile.txt`, saved in your current directory with one option and setting (other settings will be defaulted as defined in `<userhome>/.conan/profiles/default`):

```
$ conan install . -o PkgName:use_debug_mode=on -s compiler=clang
```

---

**Note:** You have to take into account that **settings** are cached as defaults in the **conaninfo.txt** file, so you don't have to type them again and again in the **conan install** or **conan create** commands.

However, the default **options** are defined in your **conanfile**. If you want to change the default options across all your **conan install** commands, change them in the **conanfile**. When you change the **options** on the command line, they are only changed for one shot. Next time, **conan install** will take the **conanfile** options as default values, if you don't specify them again in the command line.

---

- Install the **OpenCV/2.4.10@lasote/testing** reference with its default options and default settings from `<userhome>/.conan/profiles/default`:

```
$ conan install opencv/2.4.10@lasote/testing
```

- Install the **OpenCV/2.4.10@lasote/testing** reference updating the recipe and the binary package if new upstream versions are available:

```
$ conan install opencv/2.4.10@lasote/testing --update
```

### build options

Both the conan **install** and **create** commands have options to specify whether conan should try to build things or not:

- **`--build=never`**: This is the default option. It is not necessary to write it explicitly. Conan will not try to build packages when the requested configuration does not match, in which case it will throw an error.
- **`--build=missing`**: Conan will try to build from source, all packages of which the requested configuration was not found on any of the active remotes.
- **`--build=outdated`**: Conan will try to build from code if the binary is not built with the current recipe or when missing binary package.

- **--build=[pattern]**: A fnmatch file pattern of a package name. E.g., `zl*` will match `zlib` package. Conan will force the build of the packages, the name of which matches the given **pattern**. Several patterns can be specified, chaining multiple options, e.g., **--build=pattern1 --build=pattern2**.
- **--build**: Always build everything from source. Produces a clean re-build of all packages and transitively dependent packages

### env variables

With the **-e** parameters you can define:

- Global environment variables (**-e SOME_VAR="SOME_VALUE"**). These variables will be defined before the *build* step in all the packages and will be cleaned after the *build* execution.
- Specific package environment variables (**-e zlib:SOME_VAR="SOME_VALUE"**). These variables will be defined only in the specified packages (e.g., zlib).

You can specify this variables not only for your direct `requires` but for any package in the dependency graph.

If you want to define an environment variable but you want to append the variables declared in your requirements you can use the [] syntax:

```
$ conan install . -e PYTHONPATH=[/other/path]
```

This way the first entry in the PYTHONPATH variable will be **/other/path** but the PYTHONPATH values declared in the requirements of the project will be appended at the end using the system path separator.

### settings

With the **-s** parameters you can define:

- Global settings (**-s compiler="Visual Studio"**). Will apply to all the requires.
- Specific package settings (**-s zlib:compiler="MinGW"**). Those settings will be applied only to the specified packages.

You can specify custom settings not only for your direct `requires` but for any package in the dependency graph.

### options

With the **-o** parameters you can only define specific package options.

```
$ conan install . -o zlib:shared=True
$ conan install . -o zlib:shared=True -o bzip2:option=132
# you can also apply the same options to many packages with wildcards:
$ conan install . -o *:shared=True
```

**Note:** You can use *profiles* files to create predefined sets of **settings**, **options** and **environment variables**.

### conan config

```
$ conan config [-h] {rm,set,get,install} ...
```

Manages Conan configuration. Used to edit conan.conf, or install config files.

```
positional arguments:
  {rm,set,get,install}  sub-command help
    rm                  Remove an existing config element
    set                 Set a value for a configuration item
    get                 Get the value of configuration item
    install             install a full configuration from a local or remote
                        zip file

optional arguments:
  -h, --help            show this help message and exit
```

**Examples**

- Change the logging level to 10:

```
$ conan config set log.level=10
```

- Get the logging level:

```
$ conan config get log.level
$> 10
```

### conan config install

The `config install` is intended to share the Conan client configuration. For example, in a company or organization, is important to have common `settings.yml`, `profiles`, etc.

It can get its configuration files from a local or remote zip file, or a local directory. It then installs the files in the local Conan configuration.

The configuration may contain all or a subset of the allowed configuration files. Only the files that are present will be replaced. The only exception is the **conan.conf** file for which only the variables declared will be installed, leaving the other variables unchanged.

This means for example that **profiles** and **hooks** files will be overwritten if already present, but no profile or hook file that the user has in the local machine will be deleted.

All the configuration files will be copied to the conan home directory. These are the special files and the rules applied to merge them:

| File | How it is applied |
|---|---|
| profiles/MyProfile | Overrides the local ~/.conan/profiles/MyProfile if already exists |
| settings.yml | Overrides the local ~/.conan/settings.yml |
| remotes.txt | Overrides remotes. Will remove remotes that are not present in file |
| config/conan.conf | Merges the variables, overriding only the declared variables |

The file *remotes.txt* is the only file listed above which does not have a direct counterpart in the `~/.conan` folder. Its format is a list of entries, one on each line, with the form

```
[remote name] [remote url] [bool]
```

where `[bool]` (either `True` or `False`) indicates whether SSL should be used to verify that remote.

The local cache *registry.txt* file contains the remotes definitions, as well as the mapping from packages to remotes. In general it is not a good idea to add it to the installed files. That being said, the remote definitions part of the

*registry.txt* file uses the format required for *remotes.txt*, so you may find it provides a helpful starting point when writing a *remotes.txt* to be packaged in a Conan client configuration.

The specified URL will be stored in the `general.config_install` variable of the `conan.conf` file, so following calls to **`conan config install`** command doesn't need to specify the URL.

**Examples**:

- Install the configuration from a URL:

```
$ conan config install http://url/to/some/config.zip
```

  Conan config command stores the specified URL in the conan.conf `general.config_install` variable.

- Install the configuration from a Git repository:

```
$ conan config install http://github.com/user/conan_config/.git
```

  You can also force the git download by using **`--type git`** (in case it is not deduced from the URL automatically):

```
$ conan config install http://github.com/user/conan_config/.git --type git
```

- Install from a URL skipping SSL verification:

```
$ conan config install http://url/to/some/config.zip --verify-ssl=False
```

  This will disable the SSL check of the certificate. This option is defaulted to `True`.

- Refresh the configuration again:

```
$ conan config install
```

  It's not needed to specify the url again, it is already stored.

- Install the configuration from a local path:

```
$ conan config install /path/to/some/config.zip
```

### conan get

```
$ conan get [-h] [-p PACKAGE] [-r REMOTE] [-raw] reference [path]
```

Gets a file or list a directory of a given reference or package.

```
positional arguments:
  reference             package recipe reference
  path                  Path to the file or directory. If not specified will
                        get the conanfile if only a reference is specified and
                        a conaninfo.txt file contents if the package is also
                        specified

optional arguments:
  -h, --help            show this help message and exit
  -p PACKAGE, --package PACKAGE
                        Package ID
  -r REMOTE, --remote REMOTE
```

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```
                      Get from this specific remote
  -raw, --raw         Do not decorate the text
```

**Examples**:

- Print the conanfile.py from a remote package:

```
$ conan get zlib/1.2.8@conan/stable -r conan-center
```

- List the files for a local package recipe:

```
$ conan get zlib/1.2.11@conan/stable .

Listing directory '.':
 CMakeLists.txt
 conanfile.py
 conanmanifest.txt
```

- Print a file from a recipe folder:

```
$ conan get zlib/1.2.11@conan/stable conanmanifest.txt
```

- Print the conaninfo.txt file for a binary package:

```
$ conan get zlib/1.2.11@conan/stable -p 09512ff863f37e98ed748eadd9c6df3e4ea424a8
```

```
[settings]
    arch=x86_64
    build_type=Release
    compiler=apple-clang
    compiler.version=8.1
    os=Macos

[requires]


[options]
    # ...
```

- List the files from a binary package in a remote:

```
$ conan get zlib/1.2.11@conan/stable . -p␣
↪09512ff863f37e98ed748eadd9c6df3e4ea424a8 -r conan-center

Listing directory '.':
 conan_package.tgz
 conaninfo.txt
 conanmanifest.txt
```

### conan info

```
$ conan info [-h] [--paths] [-bo BUILD_ORDER] [-g GRAPH]
             [-if INSTALL_FOLDER] [-j [JSON]] [-n ONLY]
             [--package-filter [PACKAGE_FILTER]] [-db [DRY_BUILD]]
```

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```
              [-b [BUILD]] [-e ENV] [-o OPTIONS] [-pr PROFILE] [-r REMOTE]
              [-s SETTINGS] [-u]
              path_or_reference
```

Gets information about the dependency graph of a recipe. It can be used with a recipe or a reference for any existing package in your local cache.

```
positional arguments:
  path_or_reference     Path to a folder containing a recipe (conanfile.py or
                        conanfile.txt) or to a recipe file. e.g.,
                        ./my_project/conanfile.txt. It could also be a
                        reference

optional arguments:
  -h, --help            show this help message and exit
  --paths               Show package paths in local cache
  -bo BUILD_ORDER, --build-order BUILD_ORDER
                        given a modified reference, return an ordered list to
                        build (CI)
  -g GRAPH, --graph GRAPH
                        Creates file with project dependencies graph. It will
                        generate a DOT or HTML file depending on the filename
                        extension
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        local folder containing the conaninfo.txt and
                        conanbuildinfo.txt files (from a previous conan
                        install execution). Defaulted to current folder,
                        unless --profile, -s or -o is specified. If you
                        specify both install-folder and any setting/option it
                        will raise an error.
  -j [JSON], --json [JSON]
                        Only with --build-order option, return the information
                        in a json. e.g --json=/path/to/filename.json or --json
                        to output the json
  -n ONLY, --only ONLY  Show only the specified fields: "id", "build_id",
                        "remote", "url", "license", "requires", "update",
                        "required", "date", "author", "None". '--paths'
                        information can also be filtered with options
                        "export_folder", "build_folder", "package_folder",
                        "source_folder". Use '--only None' to show only
                        references.
  --package-filter [PACKAGE_FILTER]
                        Print information only for packages that match the
                        filter pattern e.g., MyPackage/1.2@user/channel or
                        MyPackage*
  -db [DRY_BUILD], --dry-build [DRY_BUILD]
                        Apply the --build argument to output the information,
                        as it would be done by the install command
  -b [BUILD], --build [BUILD]
                        Given a build policy, return an ordered list of
                        packages that would be built from sources during the
                        install command
  -e ENV, --env ENV     Environment variables that will be set during the
                        package build, -e CXX=/usr/bin/clang++
  -o OPTIONS, --options OPTIONS
                        Define options values, e.g., -o Pkg:with_qt=true
```

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```
  -pr PROFILE, --profile PROFILE
                        Apply the specified profile to the install command
  -r REMOTE, --remote REMOTE
                        Look in the specified remote server
  -s SETTINGS, --settings SETTINGS
                        Settings to build the package, overwriting the
                        defaults. e.g., -s compiler=gcc
  -u, --update          Check updates exist from upstream remotes
```

**Examples**:

```
$ conan info .
$ conan info myproject_folder
$ conan info myproject_folder/conanfile.py
$ conan info Hello/1.0@user/channel
```

The output will look like:

```
Dependency/0.1@user/channel
 ID: 5ab84d6acfe1f23c4fae0ab88f26e3a396351ac9
 BuildID: None
 Remote: None
 URL: http://...
 License: MIT
 Updates: Version not checked
 Creation date: 2017-10-31 14:45:34
 Required by:
    Hello/1.0@user/channel

Hello/1.0@user/channel
 ID: 5ab84d6acfe1f23c4fa5ab84d6acfe1f23c4fa8
 BuildID: None
 Remote: None
 URL: http://...
 License: MIT
 Updates: Version not checked
 Required by:
    Project
 Requires:
    Hello0/0.1@user/channel
```

**conan info** builds the complete dependency graph, like **conan install** does. The main difference is that it doesn't try to install or build the binaries, but the package recipes will be retrieved from remotes if necessary.

It is very important to note, that the **info** command outputs the dependency graph for a given configuration (settings, options), as the dependency graph can be different for different configurations. Then, the input to the **conan info** command is the same as **conan install**, the configuration can be specified directly with settings and options, or using profiles.

Also, if you did a previous **conan install** with a specific configuration, or maybe different installs with different configurations, you can reuse that information with the **--install-folder** argument:

```
$ # dir with a conanfile.txt
$ mkdir build_release && cd build_release
$ conan install .. --profile=gcc54release
$ cd .. && mkdir build_debug && cd build_debug
$ conan install .. --profile=gcc54debug
```

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```
$ cd ..
$ conan info . --install-folder=build_release
> info for the release dependency graph install
$ conan info . --install-folder=build_debug
> info for the debug dependency graph install
```

It is possible to use the **conan info** command to extract useful information for Continuous Integration systems. More precisely, it has the **--build-order, -bo** option, that will produce a machine-readable output with an ordered list of package references, in the order they should be built. E.g., let's assume that we have a project that depends on Boost and Poco, which in turn depends on OpenSSL and zlib transitively. So we can query our project with a reference that has changed (most likely due to a git push on that package):

```
$ conan info . -bo zlib/1.2.11@conan/stable
[zlib/1.2.11@conan/stable], [OpenSSL/1.0.2l@conan/stable], [Boost/1.60.0@lasote/
↪stable, Poco/1.7.8p3@pocoproject/stable]
```

Note the result is a list of lists. When there is more than one element in one of the lists, it means that they are decoupled projects and they can be built in parallel by the CI system.

You can also specify the `ALL` argument, if you want just to compute the whole dependency graph build order

```
$ conan info . --build-order=ALL
> [zlib/1.2.11@conan/stable], [OpenSSL/1.0.2l@conan/stable], [Boost/1.60.0@lasote/
↪stable, Poco/1.7.8p3@pocoproject/stable]
```

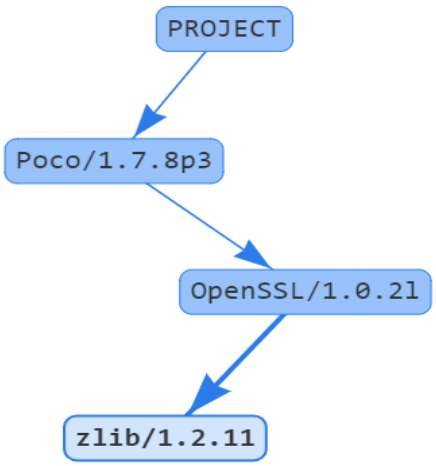
Also you can get a list of nodes that would be built (simulation) in an install command specifying a build policy with the `--build` parameter.

E.g., if I try to install `Boost/1.60.0@lasote/stable` recipe with `--build missing` build policy and `arch=x86`, which libraries will be built?

```
$ conan info Boost/1.60.0@lasote/stable --build missing -s arch=x86
bzip2/1.0.6@lasote/stable, zlib/1.2.8@lasote/stable, Boost/1.60.0@lasote/stable
```

You can generate a graph of your dependencies, in dot or html formats:

```
$ conan info .. --graph=file.html
$ file.html # or open the file, double-click
```



### conan search

```
$ conan search [-h] [-o] [-q QUERY] [-r REMOTE] [--case-sensitive]
               [--raw] [--table TABLE] [-j JSON]
               [pattern_or_reference]
```

Searches package recipes and binaries in the local cache or in a remote. If you provide a pattern, then it will search for existing package recipes matching it. If a full reference is provided (pkg/0.1@user/channel) then the existing binary packages for that reference will be displayed. If no remote is specified, the search will be done in the local cache. Search is case sensitive, exact case has to be used. For case insensitive file systems, like Windows, case sensitive search can be forced with '–case-sensitive'.

```
positional arguments:
  pattern_or_reference  Pattern or package recipe reference, e.g.,
                        'MyPackage/1.2@user/channel', 'boost/*'

optional arguments:
  -h, --help            show this help message and exit
  -o, --outdated        Show only outdated from recipe packages. This flag can
                        only be used with a reference
  -q QUERY, --query QUERY
                        Packages query: 'os=Windows AND (arch=x86 OR
                        compiler=gcc)'. The 'pattern_or_reference' parameter
                        has to be a reference: MyPackage/1.2@user/channel
  -r REMOTE, --remote REMOTE
                        Remote to search in. '-r all' searches all remotes
  --case-sensitive      Make a case-sensitive search. Use it to guarantee
                        case-sensitive search in Windows or other case-
                        insensitive file systems
  --raw                 Print just the list of recipes
  --table TABLE         Outputs html file with a table of binaries. Only valid
                        for a reference search
  -j JSON, --json JSON  json file path where the search information will be
                        written to
```

**Examples**

```
$ conan search zlib/*
$ conan search zlib/* -r=conan-center
```

To search for recipes in all defined remotes use `--all` (this is only valid for searching recipes, not binaries):

```
$ conan search zlib/* -r=all
```

If you use instead the full package recipe reference, you can explore the binaries existing for that recipe, also in a remote or in the local conan cache:

```
$ conan search Boost/1.60.0@lasote/stable
```

A query syntax is allowed to look for specific binaries, you can use `AND` and `OR` operators and parenthesis, with settings and also options.

```
$ conan search Boost/1.60.0@lasote/stable -q arch=x86_64
$ conan search Boost/1.60.0@lasote/stable -q "(arch=x86_64 OR arch=ARM) AND (build_
↪type=Release OR os=Windows)"
```

If you specify a query filter for a setting and the package recipe is not restricted by this setting, Conan won't find the packages. e.g:

```
class MyRecipe(ConanFile):
    settings="arch"
```

```
$ conan search MyRecipe/1.0@lasote/stable -q os=Windows
```

The query above won't find the `MyRecipe` binary packages (because the recipe doesn't declare "os" as a setting) unless you specify the `None` value:

```
$ conan search MyRecipe/1.0@lasote/stable -q os=None
```

You can generate a table for all binaries from a given recipe with the `--table` option:

```
$ conan search zlib/1.2.11@conan/stable --table=file.html -r=conan-center
$ file.html # or open the file, double-click
```

## zlib/1.2.11@conan/stable

| | x86 Debug shared=False | x86 Debug shared=True | x86 Release shared=False | x86 Release shared=True | x86_64 Debug shared=False | x86_64 Debug shared=True | x86_64 Release shared=False | x86_64 Release shared=True |
|---|---|---|---|---|---|---|---|---|
| Linux clang 3.9 | | | | | | | | |
| Linux clang 4.0 | | | | | | | | |
| Linux gcc 4.9 | | | | | | | | |
| Linux gcc 5.4 | | | | | | | | |
| Linux gcc 6.3 | | | | | | | | |
| Macos apple-clang 7.3 | | | | | | | | |
| Macos apple-clang 8.0 | | | | | | | | |
| Macos apple-clang 8.1 | | | | | | | | |
| Windows Visual Studio 10 (MD) | | | | | | | | |
| Windows Visual Studio 10 (MDd) | | | | | | | | |
| Windows Visual Studio 10 (MT) | | | | | | | | |
| Windows Visual Studio 10 (MTd) | | | | | | | | |
| Windows Visual Studio 12 (MD) | | | | | | | | |
| Windows Visual Studio 12 (MDd) | | | | | | | | |
| Windows Visual Studio 12 (MT) | | | | | | | | |
| Windows Visual Studio 12 (MTd) | | | | | | | | |
| Windows Visual Studio 14 (MD) | | | | | | | | |
| Windows Visual Studio 14 (MDd) | | | | | | | | |
| Windows Visual Studio 14 (MT) | | | | | | | | |
| Windows Visual Studio 14 (MTd) | | | | | | | | |
| Windows Visual Studio 15 (MD) | | | | | | | | |
| Windows Visual Studio 15 (MDd) | | | | | | | | |
| Windows Visual Studio 15 (MT) | | | | | | | | |
| Windows Visual Studio 15 (MTd) | | | | | | | | |
| Windows gcc 4.9 (dwarf2) (posix) | | | | | | | | |
| Windows gcc 4.9 (seh) (posix) | | | | | | | | |
| Windows gcc 4.9 (sjlj) (posix) | | | | | | | | |

Selected:
52365c918e417dff048f3ad367c434eb2c362d08

Legend

| | |
|---|---|
| | Outdated from recipe |
| | Updated |
| | Non existing |

### 14.1.2 Creator commands

Commands related to the creation of Conan recipes and packages:

### conan create

```
$ conan create [-h] [-j JSON] [-k] [-kb] [-ne] [-tbf TEST_BUILD_FOLDER]
               [-tf TEST_FOLDER] [-m [MANIFESTS]]
               [-mi [MANIFESTS_INTERACTIVE]] [-v [VERIFY]] [-b [BUILD]]
               [-e ENV] [-o OPTIONS] [-pr PROFILE] [-r REMOTE]
               [-s SETTINGS] [-u]
               path reference
```

Builds a binary package for a recipe (conanfile.py). Uses the specified configuration in a profile or in -s settings, -o options etc. If a 'test_package' folder (the name can be configured with -tf) is found, the command will run the consumer project to ensure that the package has been created correctly. Check 'conan test' command to know more about 'test_folder' project.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py
  reference             user/channel or pkg/version@user/channel (if name and
                        version not declared in conanfile.py) where the
                        package will be created

optional arguments:
  -h, --help            show this help message and exit
  -j JSON, --json JSON  json file path where the install information will be
                        written to
  -k, -ks, --keep-source
                        Do not remove the source folder in local cache, even
                        if the recipe changed. Use this for testing purposes
                        only
  -kb, --keep-build     Do not remove the build folder in local cache. Implies
                        --keep-source. Use this for testing purposes only
  -ne, --not-export     Do not export the conanfile.py
  -tbf TEST_BUILD_FOLDER, --test-build-folder TEST_BUILD_FOLDER
                        Working directory for the build of the test project.
  -tf TEST_FOLDER, --test-folder TEST_FOLDER
                        Alternative test folder name. By default it is
                        "test_package". Use "None" to skip the test stage
  -m [MANIFESTS], --manifests [MANIFESTS]
                        Install dependencies manifests in folder for later
                        verify. Default folder is .conan_manifests, but can be
                        changed
  -mi [MANIFESTS_INTERACTIVE], --manifests-interactive [MANIFESTS_INTERACTIVE]
                        Install dependencies manifests in folder for later
                        verify, asking user for confirmation. Default folder
                        is .conan_manifests, but can be changed
  -v [VERIFY], --verify [VERIFY]
                        Verify dependencies manifests against stored ones
  -b [BUILD], --build [BUILD]
                        Optional, use it to choose if you want to build from
                        sources: --build Build all from sources, do not use
                        binary packages. --build=never Never build, use binary
                        packages or fail if a binary package is not found.
                        --build=missing Build from code if a binary package is
                        not found. --build=outdated Build from code if the
                        binary is not built with the current recipe or when
                        missing binary package. --build=[pattern] Build always
                        these packages from source, but never build the
```

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```
                      others. Allows multiple --build parameters. 'pattern'
                      is a fnmatch file pattern of a package name. Default
                      behavior: If you don't specify anything, it will be
                      similar to '--build=never', but package recipes can
                      override it with their 'build_policy' attribute in the
                      conanfile.py.
  -e ENV, --env ENV   Environment variables that will be set during the
                      package build, -e CXX=/usr/bin/clang++
  -o OPTIONS, --options OPTIONS
                      Define options values, e.g., -o Pkg:with_qt=true
  -pr PROFILE, --profile PROFILE
                      Apply the specified profile to the install command
  -r REMOTE, --remote REMOTE
                      Look in the specified remote server
  -s SETTINGS, --settings SETTINGS
                      Settings to build the package, overwriting the
                      defaults. e.g., -s compiler=gcc
  -u, --update        Check updates exist from upstream remotes
```

This is the recommended way to create packages.

**conan create . demo/testing** is equivalent to:

```
$ conan export . demo/testing
$ conan install Hello/0.1@demo/testing --build=Hello
# package is created now, use test to test it
$ cd test_package
$ conan test . Hello/0.1@demo/testing
```

**Tip:** Sometimes you need to **skip/disable test stage** to avoid a failure while creating the package, i.e: when you are cross compiling libraries and target code cannot be executed in current host platform. In that case you can skip/disable the test package stage:

```
$ conan create . demo/testing --test-folder=None
```

**conan create** executes methods of a *conanfile.py* in the following order:

1. `config_options()`
2. `configure()`
3. `requirements()`
4. `package_id()`
5. `build_requirements()`
6. `build_id()`
7. `system_requirements()`
8. `source()`
9. `imports()`
10. `build()`
11. `package()`
12. `package_info()`

In case of installing a pre-built binary, steps from 5 to 11 will be skipped. Note that `deploy()` method is only used in **`conan install`**.

### conan export

```
$ conan export [-h] [-k] path reference
```

Copies the recipe (conanfile.py & associated files) to your local cache. Use the 'reference' param to specify a user and channel where to export it. Once the recipe is in the local cache it can be shared, reused and to any remote with the 'conan upload' command.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py
  reference             user/channel, or Pkg/version@user/channel (if name and
                        version are not declared in the conanfile.py

optional arguments:
  -h, --help            show this help message and exit
  -k, -ks, --keep-source
                        Do not remove the source folder in local cache, even
                        if the recipe changed. Use this for testing purposes
                        only
```

The `export` command will run a linting of the package recipe, looking for possible inconsistencies, bugs and py2-3 incompatibilities. It is possible to customize the rules for this linting, as well as totally disabling it. Look at the `recipe_linter` and `pylintrc` variables in *conan.conf* and the `PYLINTRC` environment variable.

**Examples**

- Export a recipe using a full reference. Only valid if `name` and `version` are not declared in the recipe:

  ```
  $ conan export . mylib/1.0@myuser/channel
  ```

- Export a recipe from any folder directory, under the `myuser/stable` user and channel:

  ```
  $ conan export ./folder_name myuser/stable
  ```

- Export a recipe without removing the source folder in the local cache:

  ```
  $ conan export . fenix/stable -k
  ```

### conan export-pkg

```
$ conan export-pkg [-h] [-bf BUILD_FOLDER] [-e ENV] [-f]
                   [-if INSTALL_FOLDER] [-o OPTIONS] [-pr PROFILE]
                   [-pf PACKAGE_FOLDER] [-s SETTINGS] [-sf SOURCE_FOLDER]
                   path reference
```

Exports a recipe, then creates a package from local source and build folders. The package is created by calling the package() method applied to the local folders '–source-folder' and '–build-folder' It's created in the local cache for the specified 'reference' and for the specified '–settings', '–options' and or '–profile'.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py
  reference             user/channel or pkg/version@user/channel (if name and
                        version are not declared in the conanfile.py)

optional arguments:
  -h, --help            show this help message and exit
  -bf BUILD_FOLDER, --build-folder BUILD_FOLDER
                        Directory for the build process. Defaulted to the
                        current directory. A relative path to current
                        directory can also be specified
  -e ENV, --env ENV     Environment variables that will be set during the
                        package build, -e CXX=/usr/bin/clang++
  -f, --force           Overwrite existing package if existing
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Directory containing the conaninfo.txt and
                        conanbuildinfo.txt files (from previous 'conan
                        install'). Defaulted to --build-folder If these files
                        are found in the specified folder and any of '-e',
                        '-o', '-pr' or '-s' arguments are used, it will raise
                        an error.
  -o OPTIONS, --options OPTIONS
                        Define options values, e.g., -o pkg:with_qt=true
  -pr PROFILE, --profile PROFILE
                        Profile for this package
  -pf PACKAGE_FOLDER, --package-folder PACKAGE_FOLDER
                        folder containing a locally created package. If a
                        value is given, it won't call the recipe 'package()'
                        method, and will run a copy of the provided folder.
  -s SETTINGS, --settings SETTINGS
                        Define settings values, e.g., -s compiler=gcc
  -sf SOURCE_FOLDER, --source-folder SOURCE_FOLDER
                        Directory containing the sources. Defaulted to the
                        conanfile's directory. A relative path to current
                        directory can also be specified
```

**conan export-pkg** executes the following methods of a *conanfile.py* whenever `--package-folder` is used:

1. `config_options()`
2. `configure()`
3. `requirements()`
4. `package_id()`

In case a package folder is not specified, this command will also execute:

5. `package()`

Note that this is **not** the normal or recommended flow for creating Conan packages, as packages created this way will not have a reproducible build from sources. This command should be used when:

- It is not possible to build the packages from sources (only pre-built binaries available).
- You are developing your package locally and want to export the built artifacts to the local cache.

The command **conan new <ref> --bare** will create a simple recipe that could be used in combination with the `export-pkg` command. Check this *How to package existing binaries*.

**export-pkg** has two different modes of operation:

- Specifying **--package-folder** will perform a copy of the given folder, without executing the `package()` method. Use it if you have already created the package, for example with **conan package** or with `cmake.install()` from the `build()` step.
- Specifying **--build-folder** and/or **--source-folder** will execute the `package()` method, to filter, select and arrange the layout of the artifacts.

**Examples**:

- Create a package from a directory containing the binaries for Windows/x86/Release:

  Having these files:

```
Release_x86/lib/libmycoollib.a
Release_x86/lib/other.a
Release_x86/include/mylib.h
Release_x86/include/other.h
```

  Run:

```
$ conan new Hello/0.1 --bare  # In case you still don't have a recipe for the␣
↪binaries
$ conan export-pkg . Hello/0.1@user/stable -s os=Windows -s arch=x86 -s build_
↪type=Release --build-folder=Release_x86
```

- Create a package from a user folder build and sources folders:

  Given these files in the current folder

```
sources/include/mylib.h
sources/src/file.cpp
build/lib/mylib.lib
build/lib/mylib.tmp
build/file.obj
```

  And assuming the `Hello/0.1@user/stable` recipe has a `package()` method like this:

```
def package(self):
    self.copy("*.h", dst="include", src="include")
    self.copy("*.lib", dst="lib", keep_path=False)
```

  Then, the following code will create a package in the conan local cache:

```
$ conan export-pkg . Hello/0.1@user/stable -pr=myprofile --source-folder=sources -
↪-build-folder=build
```

  And such package will contain just the files:

```
include/mylib.h
lib/mylib.lib
```

- Building a conan package (for architecture x86) in a local directory and then send it to the local cache:

  **conanfile.py**

```
from conans import ConanFile, CMake, tools

class LibConan(ConanFile):
    name = "Hello"
    version = "0.1"
```

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```
    ...

    def source(self):
        self.run("git clone https://github.com/memsharded/hello.git")

    def build(self):
        cmake = CMake(self)
        cmake.configure(source_folder="hello")
        cmake.build()

    def package(self):
        self.copy("*.h", dst="include", src="include")
        self.copy("*.lib", dst="lib", keep_path=False)
```

First we will call **conan source** to get our source code in the *src* directory, then **conan install** to install the requirements and generate the info files, **conan build** to build the package, and finally **conan export-pkg** to send the binary files to a package in the local cache:

```
$ conan source . --source-folder src
$ conan install . --install-folder build_x86 -s arch=x86
$ conan build . --build-folder build_x86 --source-folder src
$ conan export-pkg . Hello/0.1@user/stable --build-folder build_x86 -s arch=x86
```

**Note:** Note that if **--profile** or settings, options, are not provided to **export-pkg**, the configuration will be extracted from the information from a previous **conan install**. That information might be incomplete in some edge cases, so we strongly recommend the usage of **--profile** or **--settings, --options**, etc.

### conan new

```
$ conan new [-h] [-t] [-i] [-c] [-s] [-b] [-cis] [-cilg] [-cilc] [-cio]
            [-ciw] [-ciglg] [-ciglc] [-ciccg] [-ciccc] [-cicco] [-gi]
            [-ciu CI_UPLOAD_URL]
            name
```

Creates a new package recipe template with a 'conanfile.py' and optionally, 'test_package' testing files.

```
positional arguments:
  name                  Package name, e.g.: "Poco/1.7.3" or complete reference
                        for CI scripts: "Poco/1.7.3@conan/stable"

optional arguments:
  -h, --help            show this help message and exit
  -t, --test            Create test_package skeleton to test package
  -i, --header          Create a headers only package template
  -c, --pure-c          Create a C language package only package, deleting
                        "self.settings.compiler.libcxx" setting in the
                        configure method
  -s, --sources         Create a package with embedded sources in "src"
                        folder, using "exports_sources" instead of retrieving
                        external code with the "source()" method
  -b, --bare            Create the minimum package recipe, without build()
                        methodUseful in combination with "export-pkg" command
```

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```
  -cis, --ci-shared     Package will have a "shared" option to be used in CI
  -cilg, --ci-travis-gcc
                        Generate travis-ci files for linux gcc
  -cilc, --ci-travis-clang
                        Generate travis-ci files for linux clang
  -cio, --ci-travis-osx
                        Generate travis-ci files for OSX apple-clang
  -ciw, --ci-appveyor-win
                        Generate appveyor files for Appveyor Visual Studio
  -ciglg, --ci-gitlab-gcc
                        Generate GitLab files for linux gcc
  -ciglc, --ci-gitlab-clang
                        Generate GitLab files for linux clang
  -ciccg, --ci-circleci-gcc
                        Generate CicleCI files for linux gcc
  -ciccc, --ci-circleci-clang
                        Generate CicleCI files for linux clang
  -cicco, --ci-circleci-osx
                        Generate CicleCI files for OSX apple-clang
  -gi, --gitignore      Generate a .gitignore with the known patterns to
                        excluded
  -ciu CI_UPLOAD_URL, --ci-upload-url CI_UPLOAD_URL
                        Define URL of the repository to upload
```

**Examples**:

- Create a new `conanfile.py` for a new package **mypackage/1.0@myuser/stable**

```
$ conan new mypackage/1.0
```

- Create also a `test_package` folder skeleton:

```
$ conan new mypackage/1.0 -t
```

- Create files for travis (both Linux and OSX) and appveyor Continuous Integration:

```
$ conan new mypackage/1.0@myuser/stable -t -cilg -cio -ciw
```

- Create files for gitlab (linux) Continuous integration and set upload conan server:

```
$ conan new mypackage/1.0@myuser/stable -t -ciglg -ciglc -ciu https://api.bintray.
↪com/conan/myuser/myrepo
```

### conan upload

```
$ conan upload [-h] [-p PACKAGE] [-q QUERY] [-r REMOTE] [--all]
               [--skip-upload] [--force] [--check] [-c] [--retry RETRY]
               [--retry-wait RETRY_WAIT] [-no [{all,recipe}]] [-j JSON]
               pattern_or_reference
```

Uploads a recipe and binary packages to a remote. If no remote is specified, the first configured remote (by default conan-center, use 'conan remote list' to list the remotes) will be used.

```
positional arguments:
  pattern_or_reference  Pattern or package recipe reference, e.g.,
```

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```
                        'MyPackage/1.2@user/channel', 'boost/*'

optional arguments:
  -h, --help            show this help message and exit
  -p PACKAGE, --package PACKAGE
                        package ID to upload
  -q QUERY, --query QUERY
                        Only upload packages matching a specific query.
                        Packages query: 'os=Windows AND (arch=x86 OR
                        compiler=gcc)'. The 'pattern_or_reference' parameter
                        has to be a reference: MyPackage/1.2@user/channel
  -r REMOTE, --remote REMOTE
                        upload to this specific remote
  --all                 Upload both package recipe and packages
  --skip-upload         Do not upload anything, just run the checks and the
                        compression
  --force               Do not check conan recipe date, override remote with
                        local
  --check               Perform an integrity check, using the manifests,
                        before upload
  -c, --confirm         Upload all matching recipes without confirmation
  --retry RETRY         In case of fail retries to upload again the specified
                        times. Defaulted to 2
  --retry-wait RETRY_WAIT
                        Waits specified seconds before retry again
  -no [{all,recipe}], --no-overwrite [{all,recipe}]
                        Uploads package only if recipe is the same as the
                        remote one
  -j JSON, --json JSON  json file path where the upload information will be
                        written to
```

**Examples**:

Uploads a package recipe (*conanfile.py* and the exported files):

```
$ conan upload OpenCV/1.4.0@lasote/stable
```

Uploads a package recipe and all the generated binary packages to a specified remote:

```
$ conan upload OpenCV/1.4.0@lasote/stable --all -r my_remote
```

Uploads all recipes and binary packages from our local cache to `my_remote` without confirmation:

```
$ conan upload "*" --all -r my_remote -c
```

Uploads the recipe for OpenCV alongside any of its binary packages which are built with settings `arch=x86_64` and `os=Linux` from our local cache to `my_remote`:

```
$ conan upload OpenCV/1.4.0@lasote/stable -q 'arch=x86_64 and os=Linux' -r my_remote
```

Upload all local packages and recipes beginning with "Op" retrying 3 times and waiting 10 seconds between upload attempts:

```
$ conan upload "Op*" --all -r my_remote -c --retry 3 --retry-wait 10
```

Upload packages without overwriting the recipe and packages if the recipe has changed:

```
$ conan upload OpenCV/1.4.0@lasote/stable --all --no-overwrite  # defaults to --no-
↪overwrite all
```

Upload packages without overwriting the recipe if the packages have changed:

```
$ conan upload OpenCV/1.4.0@lasote/stable --all --no-overwrite recipe
```

### conan test

```
$ conan test [-h] [-tbf TEST_BUILD_FOLDER] [-b [BUILD]] [-e ENV]
             [-o OPTIONS] [-pr PROFILE] [-r REMOTE] [-s SETTINGS] [-u]
             path reference
```

Test a package consuming it from a conanfile.py with a test() method. This command installs the conanfile dependencies (including the tested package), calls a 'conan build' to build test apps and finally executes the test() method. The testing recipe does not require name or version, neither definition of package() or package_info() methods. The package to be tested must exist in the local cache or in any configured remote.

```
positional arguments:
  path                  Path to the "testing" folder containing a conanfile.py
                        or to a recipe file with test() methode.g. conan
                        test_package/conanfile.py pkg/version@user/channel
  reference             pkg/version@user/channel of the package to be tested

optional arguments:
  -h, --help            show this help message and exit
  -tbf TEST_BUILD_FOLDER, --test-build-folder TEST_BUILD_FOLDER
                        Working directory of the build process.
  -b [BUILD], --build [BUILD]
                        Optional, use it to choose if you want to build from
                        sources: --build Build all from sources, do not use
                        binary packages. --build=never Never build, use binary
                        packages or fail if a binary package is not found.
                        --build=missing Build from code if a binary package is
                        not found. --build=outdated Build from code if the
                        binary is not built with the current recipe or when
                        missing binary package. --build=[pattern] Build always
                        these packages from source, but never build the
                        others. Allows multiple --build parameters. 'pattern'
                        is a fnmatch file pattern of a package name. Default
                        behavior: If you don't specify anything, it will be
                        similar to '--build=never', but package recipes can
                        override it with their 'build_policy' attribute in the
                        conanfile.py.
  -e ENV, --env ENV     Environment variables that will be set during the
                        package build, -e CXX=/usr/bin/clang++
  -o OPTIONS, --options OPTIONS
                        Define options values, e.g., -o Pkg:with_qt=true
  -pr PROFILE, --profile PROFILE
                        Apply the specified profile to the install command
  -r REMOTE, --remote REMOTE
                        Look in the specified remote server
  -s SETTINGS, --settings SETTINGS
                        Settings to build the package, overwriting the
                        defaults. e.g., -s compiler=gcc
  -u, --update          Check updates exist from upstream remotes
```

This command is util for testing existing packages, that have been previously built (with **conan create**, for example). **conan create** will automatically run this test if a *test_package* folder is found besides the *conanfile.py*, or if the **--test-folder** argument is provided to **conan create**.

**Example**:

```
$ conan new Hello/0.1 -s -t
$ mv test_package test_package2
$ conan create . user/testing
# doesn't automatically run test, it has been renamed
# now run test
$ conan test test_package2 Hello/0.1@user/testing
```

The test package folder, could be elsewhere, or could be even applied to different versions of the package.

### 14.1.3 Package development commands

Commands related to the local (user space) development of a Conan package:

#### conan source

```
$ conan source [-h] [-sf SOURCE_FOLDER] [-if INSTALL_FOLDER] path
```

Calls your local conanfile.py 'source()' method. Usually downloads and uncompresses the package sources.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py

optional arguments:
  -h, --help            show this help message and exit
  -sf SOURCE_FOLDER, --source-folder SOURCE_FOLDER
                        Destination directory. Defaulted to current directory
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Directory containing the conaninfo.txt and
                        conanbuildinfo.txt files (from previous 'conan
                        install'). Defaulted to --build-folder Optional,
                        source method will run without the information
                        retrieved from the conaninfo.txt and
                        conanbuildinfo.txt, only required when using
                        conditional source() based on settings, options,
                        env_info and user_info
```

The `source()` method might use (optional) *settings*, *options* and *environment variables* from the specified profile and dependencies information from the declared `deps_XXX_info` objects in the conanfile requirements.

All that information is saved automatically in the *conaninfo.txt* and *conanbuildinfo.txt* files respectively, when you run the **conan install** command. Those files have to be located in the specified **--install-folder**.

**Examples**:

- Call a local recipe's source method: In user space, the command will execute a local *conanfile.py* `source()` method, in the *src* folder in the current directory.

  ```
  $ conan new lib/1.0@conan/stable
  $ conan source . --source-folder mysrc
  ```

- In case you need the settings/options or any info from the requirements, perform first an install:

```
$ conan install . --install-folder mybuild
$ conan source . --source-folder mysrc --install-folder mybuild
```

### conan build

```
$ conan build [-h] [-b] [-bf BUILD_FOLDER] [-c] [-i] [-t]
              [-if INSTALL_FOLDER] [-pf PACKAGE_FOLDER]
              [-sf SOURCE_FOLDER]
              path
```

Calls your local conanfile.py 'build()' method. The recipe will be built in the local directory specified by –build-folder, reading the sources from –source-folder. If you are using a build helper, like CMake(), the –package- folder will be configured as destination folder for the install step.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py

optional arguments:
  -h, --help            show this help message and exit
  -b, --build           Execute the build step (variable should_build=True).
                        When specified, configure/install/test won't run
                        unless --configure/--install/--test specified
  -bf BUILD_FOLDER, --build-folder BUILD_FOLDER
                        Directory for the build process. Defaulted to the
                        current directory. A relative path to current
                        directory can also be specified
  -c, --configure       Execute the configuration step (variable
                        should_configure=True). When specified,
                        build/install/test won't run unless
                        --build/--install/--test specified
  -i, --install         Execute the install step (variable
                        should_install=True). When specified,
                        configure/build/test won't run unless
                        --configure/--build/--test specified
  -t, --test            Execute the test step (variable should_test=True).
                        When specified, configure/build/install won't run
                        unless --configure/--build/--install specified
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Directory containing the conaninfo.txt and
                        conanbuildinfo.txt files (from previous 'conan
                        install'). Defaulted to --build-folder
  -pf PACKAGE_FOLDER, --package-folder PACKAGE_FOLDER
                        Directory to install the package (when the build
                        system or build() method does it). Defaulted to the
                        '{build_folder}/package' folder. A relative path can
                        be specified, relative to the current folder. Also an
                        absolute path is allowed.
  -sf SOURCE_FOLDER, --source-folder SOURCE_FOLDER
                        Directory containing the sources. Defaulted to the
                        conanfile's directory. A relative path to current
                        directory can also be specified
```

The `build()` method might use *settings*, *options* and *environment variables* from the specified profile and dependencies information from the declared `deps_XXX_info` objects in the conanfile requirements. All that information is

saved automatically in the *conaninfo.txt* and *conanbuildinfo.txt* files respectively, when you run the **conan install** command. Those files have to be located in the specified **--build-folder** or in the **--install-folder** if specified.

The **--configure, --build, --install** arguments control which parts of the `build()` are actually executed. They have related conanfile boolean variables `should_configure`, `should_build`, `should_install`, which are `True` by default, but that will change if some of these arguments are used in the command line. The `CMake` and `Meson` and `AutotoolsBuildEnvironment` helpers already use these variables.

**Example**: Building a conan package (for architecture x86) in a local directory.

Listing 1: conanfile.py

```
from conans import ConanFile, CMake, tools

class LibConan(ConanFile):
    ...

    def source(self):
        self.run("git clone https://github.com/memsharded/hello.git")

    def build(self):
        cmake = CMake(self)
        cmake.configure(source_folder="hello")
        cmake.build()
```

First we will call **conan source** to get our source code in the *src* directory, then **conan install** to install the requirements and generate the info files, and finally **conan build** to build the package:

```
$ conan source . --source-folder src
$ conan install . --install-folder build_x86 -s arch=x86
$ conan build . --build-folder build_x86 --source-folder src
```

Or if we want to create the `conaninfo.txt` and `conanbuildinfo.txt` files in a different folder:

```
$ conan source . --source-folder src
$ conan install . --install-folder install_x86 -s arch=x86
$ conan build . --build-folder build_x86 --install-folder install_x86 --source-
↪folder src
```

However, we recommend the `conaninfo.txt` and `conanbuildinfo.txt` to be generated in the same –build-folder, otherwise, you will need to specify a different folder in your build system to include the files generators file. E.g., `conanbuildinfo.cmake`

**Example**: Control the build stages

You can control the build stages using **--configure/--build/--install/--test** arguments. Here is an example using the CMake build helper:

```
$ conan build . --confiure # only run cmake.configure(). Other methods will do nothing
$ conan build . --build    # only run cmake.build(). Other methods will do nothing
$ conan build . --install  # only run cmake.install(). Other methods will do nothing
$ conan build . --test     # only run cmake.test(). Other methods will do nothing
# They can be combined
$ conan build . -c -b # run cmake.configure() + cmake.build(), but not cmake.
↪install() nor cmake.test
```

If nothing is specified, all the methods will be called.

**See also:**

Read more about *should_configure, should_build, should_install, should_test*.

### conan package

```
$ conan package [-h] [-bf BUILD_FOLDER] [-if INSTALL_FOLDER]
                [-pf PACKAGE_FOLDER] [-sf SOURCE_FOLDER]
                path
```

Calls your local conanfile.py 'package()' method. This command works in the user space and it will copy artifacts from the –build-folder and –source- folder folder to the –package-folder one. It won't create a new package in the local cache, if you want to do it, use 'conan create' or 'conan export- pkg' after a 'conan build' command.

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py

optional arguments:
  -h, --help            show this help message and exit
  -bf BUILD_FOLDER, --build-folder BUILD_FOLDER
                        Directory for the build process. Defaulted to the
                        current directory. A relative path to current
                        directory can also be specified
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Directory containing the conaninfo.txt and
                        conanbuildinfo.txt files (from previous 'conan
                        install'). Defaulted to --build-folder
  -pf PACKAGE_FOLDER, --package-folder PACKAGE_FOLDER
                        folder to install the package. Defaulted to the
                        '{build_folder}/package' folder. A relative path can
                        be specified (relative to the current directory). Also
                        an absolute path is allowed.
  -sf SOURCE_FOLDER, --source-folder SOURCE_FOLDER
                        Directory containing the sources. Defaulted to the
                        conanfile's directory. A relative path to current
                        directory can also be specified
```

The `package()` method might use *settings*, *options* and *environment variables* from the specified profile and dependencies information from the declared `deps_XXX_info` objects in the conanfile requirements.

All that information is saved automatically in the *conaninfo.txt* and *conanbuildinfo.txt* files respectively, when you run **`conan install`**. Those files have to be located in the specified **`--build-folder`**.

```
$ conan install . --build-folder=build
```

#### Examples

This example shows how `package()` works in a package which can be edited and built in user folders instead of the local cache.

```
$ conan new Hello/0.1 -s
$ conan install . --install-folder=build_x86 -s arch=x86
$ conan build . --build-folder=build_x86
$ conan package . --build-folder=build_x86 --package-folder=package_x86
$ ls package/x86
> conaninfo.txt  conanmanifest.txt  include/  lib/
```

**Note:** The packages created locally are just for the user, but cannot be directly consumed by other packages, nor they can be uploaded to a remote repository. In order to make these packages available to the system, they have to be put in the conan local cache, which can be done with the **conan export-pkg** command instead of using **conan package** command:

```
$ conan new Hello/0.1 -s
$ conan install . --install-folder=build_x86 -s arch=x86
$ conan build . --build-folder=build_x86
$ conan export-pkg . Hello/0.1@user/stable --build-folder=build_x86 -s arch=x86
```

### 14.1.4 Misc commands

Other useful commands:

#### conan profile

```
$ conan profile [-h] {list,show,new,update,get,remove} ...
```

Lists profiles in the '.conan/profiles' folder, or shows profile details. The 'list' subcommand will always use the default user 'conan/profiles' folder. But the 'show' subcommand is able to resolve absolute and relative paths, as well as to map names to '.conan/profiles' folder, in the same way as the '– profile' install argument.

```
positional arguments:
  {list,show,new,update,get,remove}
    list                List current profiles
    show                Show the values defined for a profile
    new                 Creates a new empty profile
    update              Update a profile with desired value
    get                 Get a profile key
    remove              Remove a profile key

optional arguments:
  -h, --help            show this help message and exit
```

**Examples**

- List the profiles:

```
$ conan profile list
> myprofile1
> myprofile2
```

- Print profile contents:

```
$ conan profile show myprofile1
Profile myprofile1
[settings]
...
```

- Print profile contents (in the standard directory `.conan/profiles`):

```
$ conan profile show myprofile1
Profile myprofile1
[settings]
...
```

- Print profile contents (in a custom directory):

```
$ conan profile show /path/to/myprofile1
Profile myprofile1
[settings]
...
```

- Update a setting from a profile located in a custom directory:

```
$ conan profile update settings.build_type=Debug /path/to/my/profile
```

- Add a new option to the default profile:

```
$ conan profile update options.zlib:shared=True default
```

- Create a new empty profile:

```
$ conan profile new /path/to/new/profile
```

- Create a new profile detecting the settings:

```
$ conan profile new /path/to/new/profile --detect
```

### conan remote

```
$ conan remote [-h]
               {list,add,remove,update,rename,list_ref,add_ref,remove_ref,update_ref,
↪list_pref,add_pref,remove_pref,update_pref,clean}
               ...
```

Manages the remote list and the package recipes associated to a remote.

```
positional arguments:
  {list,add,remove,update,rename,list_ref,add_ref,remove_ref,update_ref,list_pref,add_
↪pref,remove_pref,update_pref,clean}
                        sub-command help
    list                List current remotes
    add                 Add a remote
    remove              Remove a remote
    update              Update the remote url
    rename              Update the remote name
    list_ref            List the package recipes and its associated remotes
    add_ref             Associate a recipe's reference to a remote
    remove_ref          Dissociate a recipe's reference and its remote
    update_ref          Update the remote associated with a package recipe
    list_pref           List the package binaries and its associated remotes
    add_pref            Associate a package reference to a remote
    remove_pref         Dissociate a package's reference and its remote
    update_pref         Update the remote associated with a binary package
    clean               Clean the list of remotes and all recipe-remote
```

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```
                        associations

optional arguments:
  -h, --help            show this help message and exit
```

**Examples**

- List remotes:

```
$ conan remote list
conan-center: https://conan.bintray.com [Verify SSL: True]
local: http://localhost:9300 [Verify SSL: True]
```

- List remotes in a format valid for *remotes.txt* (`conan config install`):

```
$ conan remote list --raw
conan-center https://conan.bintray.com True
local http://localhost:9300 True
# capture the current remotes in a text file
$ conan remote list --raw > remotes.txt
```

- Add a new remote:

```
$ conan remote add remote_name remote_url [verify_ssl]
```

  Verify SSL option can be True or False (default True). Conan client will verify the SSL certificates.

- Insert a new remote:

  Insert as the first one (position/index 0), so it is the first one to be checked:

```
$ conan remote add remote_name remote_url [verify_ssl] --insert
```

  Insert as the second one (position/index 1), so it is the second one to be checked:

```
$ conan remote add remote_name remote_url [verify_ssl] --insert=1
```

- Add or insert a remote:

Adding the `--force` argument to `conan remote add` will always work, and won't raise an error. If an existing remote exists with that remote name or URL, it will be updated with the new information. The `--insert` works the same. If not specified, the remote will be appended the last one. If specified, the command will insert the remote in the specified position

```
$ conan remote add remote_name remote_url [verify_ssl] --force --insert=1
```

- Remove a remote:

```
$ conan remote remove remote_name
```

- Remove all configured remotes (this will also remove all recipe-remote associations):

```
$ conan remote clean
```

- Update a remote:

```
$ conan remote update remote_name new_url [verify_ssl]
```

- Rename a remote:

```
$ conan remote rename remote_name new_remote_name
```

- Change an existing remote to the first position:

```
$ conan remote update remote_name same_url --insert 0
```

- List the package recipes and its associated remotes:

```
$ conan remote list_ref
bzip2/1.0.6@lasote/stable: conan.io
Boost/1.60.0@lasote/stable: conan.io
zlib/1.2.8@lasote/stable: conan.io
```

- Associate a recipe's reference to a remote:

```
$ conan remote add_ref OpenSSL/1.0.2i@conan/stable conan-center
```

- Update the remote associated with a package recipe:

```
$ conan remote update_ref OpenSSL/1.0.2i@conan/stable local-remote
```

**Note:** Check the section *How to manage SSL (TLS) certificates* section to know more about server certificates verification and client certifications management .

### conan user

```
$ conan user [-h] [-c] [-p [PASSWORD]] [-r REMOTE] [-j JSON] [name]
```

Authenticates against a remote with user/pass, caching the auth token. Useful to avoid the user and password being requested later. e.g. while you're uploading a package. You can have one user for each remote. Changing the user, or introducing the password is only necessary to perform changes in remote packages.

```
positional arguments:
  name                  Username you want to use. If no name is provided it
                        will show the current user

optional arguments:
  -h, --help            show this help message and exit
  -c, --clean           Remove user and tokens for all remotes
  -p [PASSWORD], --password [PASSWORD]
                        User password. Use double quotes if password with
                        spacing, and escape quotes if existing. If empty, the
                        password is requested interactively (not exposed)
  -r REMOTE, --remote REMOTE
                        Use the specified remote server
  -j JSON, --json JSON  json file path where the user list will be written to
```

**Examples**:

- List my user for each remote:

```
$ conan user
Current user of remote 'conan-center' set to: 'danimtb' [Authenticated]
Current user of remote 'bincrafters' set to: 'None' (anonymous)
Current user of remote 'upload_repo' set to: 'danimtb' [Authenticated]
Current user of remote 'conan-community' set to: 'danimtb' [Authenticated]
Current user of remote 'the_remote' set to: 'None' (anonymous)
```

- Change **bar** remote user to **foo**:

```
$ conan user foo -r bar
Changed user of remote 'bar' from 'None' (anonymous) to 'foo'
```

- Change **bar** remote user to **foo**, authenticating against the remote and storing the user and authentication token locally, so a later upload won't require entering credentials:

```
$ conan user foo -r bar -p mypassword
```

- Clean all local users and tokens:

```
$ conan user --clean
```

- Change **bar** remote user to **foo**, **asking user password** to authenticate against the remote and storing the user and authentication token locally, so a later upload won't require entering credentials:

```
$ conan user foo -r bar -p
Please enter a password for "foo" account:
Change 'bar' user from None (anonymous) to foo
```

**Note:** The password is not stored in the client computer at any moment. Conan uses JWT, so it gets a token (expirable by the server) checking the password against the remote credentials. If the password is correct, an authentication token will be obtained, and that token is the information cached locally. For any subsequent interaction with the remotes, the Conan client will only use that JWT token.

### conan imports

```
$ conan imports [-h] [-if INSTALL_FOLDER] [-imf IMPORT_FOLDER] [-u] path
```

Calls your local conanfile.py or conanfile.txt 'imports' method. It requires to have been previously installed and have a conanbuildinfo.txt generated file in the –install-folder (defaulted to current directory).

```
positional arguments:
  path                  Path to a folder containing a conanfile.py or to a
                        recipe file e.g., my_folder/conanfile.py With --undo
                        option, this parameter is the folder containing the
                        conan_imports_manifest.txt file generated in a
                        previous execution. e.g.: conan imports
                        ./imported_files --undo

optional arguments:
  -h, --help            show this help message and exit
  -if INSTALL_FOLDER, --install-folder INSTALL_FOLDER
                        Directory containing the conaninfo.txt and
                        conanbuildinfo.txt files (from previous 'conan
```

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```
                        install'). Defaulted to --build-folder
  -imf IMPORT_FOLDER, --import-folder IMPORT_FOLDER
                        Directory to copy the artifacts to. By default it will
                        be the current directory
  -u, --undo            Undo imports. Remove imported files
```

The `imports()` method might use *settings*, *options* and *environment variables* from the specified profile and dependencies information from the declared `deps_XXX_info` objects in the conanfile requirements.

All that information is saved automatically in the *conaninfo.txt* and *conanbuildinfo.txt* files respectively, when you run **`conan install`**. Those files have to be located in the specified **`--install-folder`**.

**Examples**

- Import files from a current conanfile in current directory:

```
$ conan install . --no-imports # Creates the conanbuildinfo.txt
$ conan imports .
```

- Remove the copied files (undo the import):

```
$ conan imports . --undo
```

### conan copy

```
$ conan copy [-h] [-p PACKAGE] [--all] [--force] reference user_channel
```

Copies conan recipes and packages to another user/channel. Useful to promote packages (e.g. from "beta" to "stable") or transfer them from one user to another.

```
positional arguments:
  reference             package reference. e.g., MyPackage/1.2@user/channel
  user_channel          Destination user/channel. e.g., lasote/testing

optional arguments:
  -h, --help            show this help message and exit
  -p PACKAGE, --package PACKAGE
                        copy specified package ID
  --all                 Copy all packages from the specified package recipe
  --force               Override destination packages and the package recipe
```

**Examples**

- Promote a package to **stable** from **beta**:

```
$ conan copy OpenSSL/1.0.2i@lasote/beta lasote/stable
```

- Change a package's username:

```
$ conan copy OpenSSL/1.0.2i@lasote/beta foo/beta
```

### conan download

```
$ conan download [-h] [-p PACKAGE] [-r REMOTE] [-re] reference
```

Downloads recipe and binaries to the local cache, without using settings. It works specifying the recipe reference and package ID to be installed. Not transitive, requirements of the specified reference will NOT be retrieved. Useful together with 'conan copy' to automate the promotion of packages to a different user/channel. Only if a reference is specified, it will download all packages from the specified remote. If no remote is specified, it will use the default remote.

```
positional arguments:
  reference             pkg/version@user/channel

optional arguments:
  -h, --help            show this help message and exit
  -p PACKAGE, --package PACKAGE
                        Force install specified package ID (ignore
                        settings/options)
  -r REMOTE, --remote REMOTE
                        look in the specified remote server
  -re, --recipe         Downloads only the recipe
```

**Examples**

- Download all **OpenSSL/1.0.2i@conan/stable** binary packages from the remote **foo**:

```
$ conan download OpenSSL/1.0.2i@conan/stable -r foo
```

- Download a single binary package of **OpenSSL/1.0.2i@conan/stable** from the remote **foo**:

```
$ conan download OpenSSL/1.0.2i@conan/stable -r foo -p␣
↪8018a4df6e7d2b4630a814fa40c81b85b9182d2
```

- Download only the recipe of package **OpenSSL/1.0.2i@conan/stable** from the remote **foo**:

```
$ conan download OpenSSL/1.0.2i@conan/stable -r foo -re
```

### conan remove

```
$ conan remove [-h] [-b [BUILDS [BUILDS ...]]] [-f] [-o]
               [-p [PACKAGES [PACKAGES ...]]] [-q QUERY] [-r REMOTE] [-s]
               [-l]
               [pattern_or_reference]
```

Removes packages or binaries matching pattern from local cache or remote. It can also be used to remove temporary source or build folders in the local conan cache. If no remote is specified, the removal will be done by default in the local conan cache.

```
positional arguments:
  pattern_or_reference  Pattern or package recipe reference, e.g.,
                        'MyPackage/1.2@user/channel', 'boost/*'

optional arguments:
  -h, --help            show this help message and exit
  -b [BUILDS [BUILDS ...]], --builds [BUILDS [BUILDS ...]]
                        By default, remove all the build folders or select
                        one, specifying the package ID
```

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```
  -f, --force           Remove without requesting a confirmation
  -o, --outdated        Remove only outdated from recipe packages. This flag
                        can only be used with a reference
  -p [PACKAGES [PACKAGES ...]], --packages [PACKAGES [PACKAGES ...]]
                        Select package to remove specifying the package ID
  -q QUERY, --query QUERY
                        Packages query: 'os=Windows AND (arch=x86 OR
                        compiler=gcc)'. The 'pattern_or_reference' parameter
                        has to be a reference: MyPackage/1.2@user/channel
  -r REMOTE, --remote REMOTE
                        Will remove from the specified remote
  -s, --src             Remove source folders
  -l, --locks           Remove locks
```

The `-q` parameter can't be used along with `-p` nor `-b` parameters.

**Examples**:

- Remove from the local cache the binary packages (the package recipes will not be removed) from all the recipes matching `OpenSSL/*` pattern:

```
$ conan remove OpenSSL/* --packages
```

- Remove the temporary build folders from all the recipes matching `OpenSSL/*` pattern without requesting confirmation:

```
$ conan remove OpenSSL/* --builds --force
```

- Remove the recipe and the binary packages from a specific remote:

```
$ conan remove OpenSSL/1.0.2@lasote/stable -r myremote
```

- Remove only Windows OpenSSL packages from local cache:

```
$ conan remove OpenSSL/1.0.2@lasote/stable -q "os=Windows"
```

### conan alias

```
$ conan alias [-h] reference target
```

Creates and exports an 'alias package recipe'. An "alias" package is a symbolic name (reference) for another package (target). When some package depends on an alias, the target one will be retrieved and used instead, so the alias reference, the symbolic name, does not appear in the final dependency graph.

```
positional arguments:
  reference   Alias reference. e.g.: mylib/1.X@user/channel
  target      Target reference. e.g.: mylib/1.12@user/channel

optional arguments:
  -h, --help  show this help message and exit
```

The command:

```
$ conan alias Hello/0.X@user/testing Hello/0.1@user/testing
```

Creates and exports a package recipe for `Hello/0.X@user/testing` with the following content:

```
from conans import ConanFile

class AliasConanfile(ConanFile):
    alias = "Hello/0.1@user/testing"
```

Such package recipe acts as a "proxy" for the aliased reference. Users depending on `Hello/0.X@user/testing` will actually use version `Hello/0.1@user/testing`. The alias package reference will not appear in the dependency graph at all. It is useful to define symbolic names, or behaviors like "always depend on the latest minor", but defined upstream instead of being defined downstream with `version-ranges`.

The "alias" package should be uploaded to servers in the same way as regular package recipes, in order to enable usage from servers.

### conan inspect [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

```
$ conan inspect [-h] [-a [ATTRIBUTE]] [-r REMOTE] [-j JSON]
                path_or_reference
```

Displays conanfile attributes, like name, version, options Works both locally, in local cache and remote

```
positional arguments:
  path_or_reference     Path to a folder containing a recipe (conanfile.py) or
                        to a recipe file. e.g., ./my_project/conanfile.py. It
                        could also be a reference

optional arguments:
  -h, --help            show this help message and exit
  -a [ATTRIBUTE], --attribute [ATTRIBUTE]
                        The attribute to be displayed, e.g "name"
  -r REMOTE, --remote REMOTE
                        look in the specified remote server
  -j JSON, --json JSON  json output file
```

Examples:

```
$ conan inspect zlib/1.2.11@conan/stable -a=name -a=version -a=options -a default_
↪options -r=conan-center
name: zlib
version: 1.2.11
options
    shared: [True, False]
default_options: shared=False
```

```
$ conan inspect zlib/1.2.11@conan/stable -a=license -a=url
license: http://www.zlib.net/zlib_license.html
url: http://github.com/conan-community/conan-zlib
```

If no specific attributes are defined via `-a`, then, some default attributes will be displayed:

```
$ conan inspect zlib/1.2.11@conan/stable
name: zlib
version: 1.2.11
url: http://github.com/conan-community/conan-zlib
license: http://www.zlib.net/zlib_license.html
author: None
description: A Massively Spiffy Yet Delicately Unobtrusive Compression Library (Also␣
↪Free, Not to Mention Unencumbered by Patents)
generators: cmake
exports: None
exports_sources: ['CMakeLists.txt']
short_paths: False
apply_env: True
build_policy: None
topics: None
```

#### conan help

```
$ conan help [-h] [command]
```

Show help of a specific command.

```
positional arguments:
  command     command

optional arguments:
  -h, --help  show this help message and exit
```

This command is equivalent to the `--help` and `-h` arguments

**Example**:

```
$ conan help get
> usage: conan get [-h] [-p PACKAGE] [-r REMOTE] [-raw] reference [path]
> Gets a file or list a directory of a given reference or package.

# same as
$ conan get -h
```

### 14.1.5 Output

JSON documents generated by the commands:

#### Install and Create output [EXPERIMENTAL]

> **Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The **`conan install`** and **`conan create`** provide a `--json` parameter to generate a file containing the information of the installation process.

The output JSON contains a two first level keys:

- **error**: `True` if the install completed without error, `False` otherwise.
- **installed**: A list of installed packages. Each element contains:
  - **recipe**: Document representing the downloaded recipe.
    - **remote**: remote URL if the recipe has been downloaded. `null` otherwise.
    - **cache**: `true`/`false`. Retrieved from cache (not downloaded).
    - **downloaded**: `true`/`false`. Downloaded from a remote (not in cache).
    - **time**: `ISO 8601` string with the time the recipe was downloaded/retrieved.
    - **error**: `true`/`false`.
    - **id**: Reference. E.g., "OpenSSL/1.0.2n@conan/stable"
    - **name**: name of the packaged library. E.g., "OpenSSL"
    - **version**: version of the packaged library. E.g., "1.0.2n"
    - **user**: user of the packaged library. E.g., "conan"
    - **channel**: channel of the packaged library. E.g., "stable"
    - **dependency**: `true`/`false`. Is the package being installed/created or a dependency. Same as *develop conanfile attribute*.
  - **packages**: List of elements, representing the binary packages downloaded for the recipe. Normally there will be only 1 element in this list, only in special cases with build requires, private dependencies and settings overridden this list could have more than one element.
    - **remote**: remote URL if the recipe has been downloaded. `null` otherwise.
    - **cache**: `true`/`false`. Retrieved from cache (not downloaded).
    - **downloaded**: `true`/`false`. Downloaded from a remote (not in cache).
    - **time**: ISO 8601 string with the time the recipe was downloaded/retrieved.
    - **error**: `true`/`false`.
    - **id**: Package ID. E.g., "8018a4df6e7d2b4630a814fa40c81b85b9182d2b"
    - **cpp_info**: dictionary containing the build information defined in the `package_info` method on the recipe.

**Example:**

```
$ conan install OpenSSL/1.0.2l@conan/stable --json install.json
```

Listing 2: install.json

```
{
    "error":false,
    "installed":[
        {
            "recipe":{
                "id":"OpenSSL/1.0.2l@conan/stable",
                "downloaded":true,
                "exported":false,
                "error":null,
                "remote":"https://api.bintray.com/conan/conan/conan-center",
                "time":"2018-11-29T11:59:53.601813",
```

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```
                "dependency":true,
                "name":"OpenSSL",
                "version":"1.0.2l",
                "user":"conan",
                "channel":"stable"
            },
            "packages":[
                {
                    "id":"606fdb601e335c2001bdf31d478826b644747077",
                    "downloaded":true,
                    "exported":false,
                    "error":null,
                    "remote":"https://api.bintray.com/conan/conan/conan-center",
                    "time":"2018-11-29T12:00:03.874284",
                    "built":false,
                    "cpp_info":{
                        "includedirs":[
                            "include"
                        ],
                        "libdirs":[
                            "lib"
                        ],
                        "resdirs":[
                            "res"
                        ],
                        "bindirs":[
                            "bin"
                        ],
                        "builddirs":[
                            ""
                        ],
                        "libs":[
                            "ssleay32",
                            "libeay32",
                            "crypt32",
                            "msi",
                            "ws2_32"
                        ],
                        "rootpath":"C:/Users/user/.conan/data/OpenSSL/1.0.2l/conan/
↪stable/package/606fdb601e335c2001bdf31d478826b644747077",
                        "version":"1.0.2l",
                        "description":"OpenSSL is an open source project that␣
↪provides a robust, commercial-grade, and full-featured toolkit for the Transport␣
↪Layer Security (TLS) and Secure Sockets Layer (SSL) protocols",
                        "public_deps":[
                            "zlib"
                        ]
                    }
                }
            ]
        },
        {"...":"..."
        }
    ]
}
```

**Note:** As this is a marked as *experimental*, some fields may be removed or added: fields `version` and `description` inside `cpp_info` will eventually be removed and paths may be changed for absolute ones.

### Search output [EXPERIMENTAL]

The **`conan search`** provides a **`--json`** parameter to generate a file containing the information of the search process.

The output JSON contains a two first level keys:

- **error**: `True` if the upload completed without error, `False` otherwise.
- **results**: A list of the remotes with the packages found. Each element contains:
  - **remote**: Name of the remote.
  - **items: List of the items found in that remote. For each item there will always be a** recipe and optionally also packages when searching them.
    - **recipe: Document representing the uploaded recipe.**
      - **id**: Reference, e.g., "OpenSSL/1.0.2n@conan/stable"
    - **packages: List of elements representing the binary packages found for the recipe.**
      - **id**: Package ID, e.g., "8018a4df6e7d2b4630a814fa40c81b85b9182d2b"
      - **options**: Dictionary of options of the package.
      - **settings**: Dictionary with settings of the package.
      - **requires**: List of requires of the package.
      - **outdated**: Boolean to show whether package is outdated from recipe or not.

**Examples:**

- Search references in all remotes: **`conan search eigen* -r all`**


```
{
    "error":false,
    "results":[
        {
            "remote":"conan-center",
            "items":[
                {
                    "recipe":{
                        "id":"eigen/3.3.4@conan/stable"
                    }
                }
            ]
        },
        {
            "remote":"upload_repo",
            "items":[
                {
                    "recipe":{
                        "id":"eigen/3.3.4@danimtb/stable"
                    }
```


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```
                },
                {
                    "recipe":{
                        "id":"eigen/3.3.4@danimtb/testing"
                    }
                }
            ]
        },
        {
            "remote":"conan-community",
            "items":[
                {
                    "recipe":{
                        "id":"eigen/3.3.4@conan/stable"
                    }
                }
            ]
        }
    ]
}
```


- Search packages of a reference in a remote: **conan search paho-c/1.2.0@conan/stable -r conan-center --json search.json**


```
{
    "error":false,
    "results":[
        {
            "remote":"conan-center",
            "items":[
                {
                    "recipe":{
                        "id":"paho-c/1.2.0@conan/stable"
                    },
                    "packages":[
                        {
                            "id":"0000193ac313953e78a4f8e82528100030ca70ee",
                            "options":{
                                "shared":"False",
                                "asynchronous":"False",
                                "SSL":"False"
                            },
                            "settings":{
                                "os":"Linux",
                                "arch":"x86_64",
                                "compiler":"gcc",
                                "build_type":"Debug",
                                "compiler.version":"4.9"
                            },
                            "requires":[

                            ],
                            "outdated":false
                        },
                        {
                            "id":"014be746b283391f79d11e4e8af3154344b58223",
```


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```
                "options":{
                    "shared":"False",
                    "asynchronous":"False",
                    "SSL":"False"
                },
                "settings":{
                    "os":"Windows",
                    "compiler.threads":"posix",
                    "compiler.exception":"seh",
                    "arch":"x86_64",
                    "compiler":"gcc",
                    "build_type":"Debug",
                    "compiler.version":"5"
                },
                "requires":[

                ],
                "outdated":false
            },
            {
              "id":"0188020dbfd167611b967ad2fa0e30710d23e920",
                "options":{
                    "shared":"True",
                    "asynchronous":"False",
                    "SSL":"False"
                },
                "settings":{
                    "os":"Macos",
                    "arch":"x86_64",
                    "compiler":"apple-clang",
                    "build_type":"Debug",
                    "compiler.version":"9.1"
                },
                "requires":[

                ],
                "outdated":false
            },
            {
                "id":"03369b0caf8c0c8d4bb84d5136112596bde4652d",
                "options":{
                    "shared":"True",
                    "asynchronous":"False",
                    "SSL":"False"
                },
                "settings":{
                    "os":"Linux",
                    "arch":"x86",
                    "compiler":"gcc",
                    "build_type":"Release",
                    "compiler.version":"5"
                },
                "requires":[

                ],
                "outdated":false
            }
```


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```
                        ]
                    }
                ]
            }
        ]
}
```

- Search references in local cache: **conan search paho-c* --json search.json**

```
{
    "error":false,
    "results":[
        {
            "remote":"None",
            "items":[
                {
                    "recipe":{
                        "id":"paho-c/1.2.0@danimtb/testing"
                    }
                }
            ]
        }
    ]
}
```

- Search packages of a reference in local cache: **conan search paho-c/1.2.0@danimtb/testing --json search.json**

```
{
    "error":false,
    "results":[
        {
            "remote":"None",
            "items":[
                {
                    "recipe":{
                        "id":"paho-c/1.2.0@danimtb/testing"
                    },
                      "packages":[
                        {
                            "id":"6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7",
                            "options":{
                                "SSL":"False",
                                "asynchronous":"False",
                                "shared":"False"
                            },
                            "settings":{
                                "arch":"x86_64",
                                "build_type":"Release",
                                "compiler":"Visual Studio",
                                "compiler.runtime":"MD",
                                "compiler.version":"15",
                                "os":"Windows"
                            },
                            "requires":[
```

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```
                ],
                "outdated":false
            },
            {
                "id":"95cd13dfc3f6b80d3ccb2a38441e3a1ad88e5a15",
                "options":{
                    "SSL":"False",
                    "asynchronous":"True",
                    "shared":"True"
                },
                "settings":{
                    "arch":"x86_64",
                    "build_type":"Release",
                    "compiler":"Visual Studio",
                    "compiler.runtime":"MD",
                    "compiler.version":"15",
                    "os":"Windows"
                },
                "requires":[

                ],
                "outdated":true
            },
            {
                "id":"970e773c5651dc2560f86200a4ea56c23f568ff9",
                "options":{
                    "SSL":"False",
                    "asynchronous":"False",
                    "shared":"True"
                },
                "settings":{
                    "arch":"x86_64",
                    "build_type":"Release",
                    "compiler":"Visual Studio",
                    "compiler.runtime":"MD",
                    "compiler.version":"15",
                    "os":"Windows"
                },
                "requires":[

                ],
                "outdated":true
            },
            {
                "id":"c4c0a49b09575515ce1dd9841a48de0c508b9d7c",
                "options":{
                    "SSL":"True",
                    "asynchronous":"False",
                    "shared":"True"
                },
                "settings":{
                    "arch":"x86_64",
                    "build_type":"Release",
                    "compiler":"Visual Studio",
                    "compiler.runtime":"MD",
                    "compiler.version":"15",
                    "os":"Windows"
```


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```
                            },
                            "requires":[
                                "OpenSSL/1.0.2n@conan/
↪stable:606fdb601e335c2001bdf31d478826b644747077",
                                "zlib/1.2.11@conan/
↪stable:6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7"
                            ],
                            "outdated":true
                        },
                        {
                            "id":"db9d6ba7004592ed2598f2c369484d4a01269110",
                            "options":{
                                "SSL":"True",
                                "asynchronous":"False",
                                "shared":"True"
                            },
                            "settings":{
                                "arch":"x86_64",
                                "build_type":"Release",
                                "compiler":"gcc",
                                "compiler.exception":"seh",
                                "compiler.threads":"posix",
                                "compiler.version":"7",
                                "os":"Windows"
                            },
                            "requires":[
                                "OpenSSL/1.0.2n@conan/
↪stable:f761d91cef7988eafb88c6b6179f4cf261609f26",
                                "zlib/1.2.11@conan/
↪stable:6dc82da13f94df549e60f9c1ce4c5d11285a4dff"
                            ],
                            "outdated":true
                        }
                    ]
                }
            ]
        }
    ]
}
```


### Upload output [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The **conan upload** provides a `--json` parameter to generate a file containing the information of the upload process.

The output JSON contains a two first level keys:

- **error**: `True` if the upload completed without error, `False` otherwise.
- **uploaded**: A list of uploaded packages. Each element contains:
  - **recipe**: Document representing the uploaded recipe.

* **id**: Reference, e.g., "OpenSSL/1.0.2n@conan/stable"
* **remote_name**: Remote name where the recipe was uploaded.
* **remote_url**: Remote URL where the recipe was uploaded.
* **time**: `ISO 8601` string with the time the recipe was uploaded.

– **packages: List of elements, representing the binary packages uploaded for the recipe.**

* **id**: Package ID, e.g., "8018a4df6e7d2b4630a814fa40c81b85b9182d2b"
* **time**: ISO 8601 string with the time the recipe was uploaded.

**Example:**

```
$ conan upload h* -all -r conan-center --json upload.json
```

Listing 3: upload.json


```
{
    "error":false,
    "uploaded":[
        {
            "recipe":{
                "id":"Hello/0.1@conan/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:19.204728"
            },
            "packages":[
                {
                    "id":"3f3387d49612e03a5306289405a2101383b861f0",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:21.534877"
                },
                {
                    "id":"6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:23.934152"
                },
                {
                    "id":"889d5d7812b4723bd3ef05693ffd190b1106ea43",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:28.195266"
                },
                {
                    "id":"e98aac15065fc710dffd1b4fbee382b087c3ad1d",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:30.495989"
                }
            ]
        },
        {
            "recipe":{
                "id":"Hello0/1.2.1@conan/testing",
```


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```
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:32.688651"
            },
            "packages":[
                {
                    "id":"5ab84d6acfe1f23c4fae0ab88f26e3a396351ac9",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:34.991721"
                }
            ]
        },
        {
            "recipe":{
                "id":"HelloApp/0.1@conan/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:36.901333"
            },
            "packages":[
                {
                    "id":"6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:39.243895"
                }
            ]
        },
        {
            "recipe":{
                "id":"HelloPythonConan/0.1@conan/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:41.181543"
            },
            "packages":[
                {
                    "id":"5ab84d6acfe1f23c4fae0ab88f26e3a396351ac9",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:43.749422"
                }
            ]
        },
        {
            "recipe":{
                "id":"HelloPythonReuseConan/0.1@conan/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:45.614096"
            },
            "packages":[
                {
                    "id":"6a051b2648c89dbd1f8ada0031105b287deea9d2",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
```


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```
                    "time":"2018-04-30T11:18:47.942491"
                }
            ]
        },
        {
            "recipe":{
                "id":"hdf5/1.8.20@acri/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:48.291756"
            },
            "packages":[

            ]
        },
        {
            "recipe":{
                "id":"http_parser/2.8.0@conan/testing",
                "remote_name":"conan-center",
                "remote_url":"https://conan.bintray.com",
                "time":"2018-04-30T11:18:48.637576"
            },
            "packages":[
                {
                    "id":"6cc50b139b9c3d27b3e9042d5f5372d327b3a9f7",
                    "remote_name":"conan-center",
                    "remote_url":"https://conan.bintray.com",
                    "time":"2018-04-30T11:18:51.125189"
                }
            ]
        }
    ]
}
```


### User output [EXPERIMENTAL]

> **Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The **`conan user`** provides a **`--json`** parameter to generate a file containing the information of the users configured per remote.

The output JSON contains a two first level keys:

- **error**: Boolean indicating whether command completed with error.
- **remotes**: A list of the remotes with the packages found. Each element contains:
  - **name**: Name of the remote.
  - **user_name**: Name of the user set for that remote.
  - **authenticated**: Boolean indicating if user is authenticated or not.

**Example:**

List users per remote: **`conan user --json user.json`**

Listing 4: *user.json*

```
{
    "error":false,
    "remotes":[
        {
            "name":"conan-center",
            "user_name":"danimtb",
            "authenticated":true
        },
        {
            "name":"bincrafters",
            "user_name":null,
            "authenticated":false
        },
        {
            "name":"conan-community",
            "user_name":"danimtb",
            "authenticated":true
        },
        {
            "name":"the_remote",
            "user_name":"foo",
            "authenticated":false
        }
    ]
}
```

### 14.1.6 Return codes

#### Return Codes

The Conan client returns different exit codes for every command depending on the situation:

#### Success

Return code: `0`

Execution terminated successfully

#### General error

Return code: `1`

Execution terminated with a general error, normally caused by a `ConanException`.

#### Migration error

Return code: `2`

Execution terminated with an error migrating configuration files to new format.

#### User Ctrl+C

Return code: `3`

Execution terminated due to manually stopping the process with `Ctrl+C` key combination.

#### User Ctrl+Break

Return code: `4`

Execution terminated due to manually stopping the profess with `Ctrl+Break` key combination.

#### SIGTERM

Return code: `5`

Execution terminated due to `SIGTERM` signal.

#### Invalid configuration

Return code: `6`

Execution terminated due to an exception caused by a `ConanInvalidConfiguration`. This exit code can be considered a success as it is expected for *configurations not supported by the recipe*.

## 14.2 conanfile.txt

Reference for *conanfile.txt* sections: requires, generators, etc.

### 14.2.1 Sections

#### [requires]

List of requirements, specifying the full reference.

```
[requires]
Poco/1.9.0@pocoproject/stable
zlib/1.2.11@conan/stable
```

This section supports references with *version ranges*:

```
[requires]
Poco/[>1.0,<1.8]@pocoproject/stable
zlib/1.2.11@conan/stable
```

### [build_requires]

List of build requirements specifying the full reference.

```
[build_requires]
7z_installer/1.0@conan/stable
```

This section supports references with *version ranges*.

In practice the `[build_requires]` will be always installed (same as `[requires]`) as installing from a *conanfile.txt* means that something is going to be built, so the build requirements are indeed needed.

It is useful and conceptually cleaner to have them in separate sections, so users of this *conanfile.txt* might quickly identify some dev-tools that they have already installed on their machine, differentiating them from the required libraries to link with.

### [generators]

List of *generators*.

```
[requires]
Poco/1.9.0@pocoproject/stable
zlib/1.2.11@conan/stable

[generators]
xcode
cmake
qmake
```

### [options]

List of *options* scoped for each package like **package_name:option = Value**.

```
[requires]
Poco/1.9.0@pocoproject/stable
zlib/1.2.11@conan/stable

[generators]
cmake

[options]
Poco:shared=True
OpenSSL:shared=True
```

### [imports]

List of files to be imported to a local directory. Read more: *imports*.

```
[requires]
Poco/1.9.0@pocoproject/stable
zlib/1.2.11@conan/stable

[generators]
cmake
```

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```
[options]
Poco:shared=True
OpenSSL:shared=True

[imports]
bin, *.dll -> ./bin # Copies all dll files from packages bin folder to my local "bin"␣
↪folder
lib, *.dylib* -> ./bin # Copies all dylib files from packages lib folder to my local
↪"bin" folder
```

The first item is the subfolder of the packages (could be the root "." one), the second is the pattern to match. Both relate to the local cache. The third (after the arrow) item, is the destination folder, living in user space, not in the local cache.

The `[imports]` section also support the same arguments as the equivalent `imports()` method in *conanfile.py*, separated with an `@`.

- **root_package** (Optional, Defaulted to *all packages in deps*): fnmatch pattern of the package name ("OpenCV", "Boost") from which files will be copied.
- **folder**: (Optional, Defaulted to `False`). If enabled, it will copy the files from the local cache to a subfolder named as the package containing the files. Useful to avoid conflicting imports of files with the same name (e.g. License).
- **ignore_case**: (Optional, Defaulted to `False`). If enabled will do a case-insensitive pattern matching.
- **excludes**: (Optional, Defaulted to `None`). Allows defining a list of patterns (even a single pattern) to be excluded from the copy, even if they match the main `pattern`.
- **keep_path** (Optional, Defaulted to `True`): Means if you want to keep the relative path when you copy the files from the **src** folder to the **dst** one. Useful to ignore (`keep_path=False`) path of *library.dll* files in the package it is imported from.

Example to collect license files from dependencies into a *licenses* folder, excluding (just an example) *.html* and *.jpeg* files:

```
[imports]
., license* -> ./licenses @ folder=True, ignore_case=True, excludes=*.html *.jpeg
```

## 14.3 conanfile.py

Reference for *conanfile.py*: attributes, methods, etc.

---

**Important:** *conanfile.py* recipes uses a variety of attributes and methods to operate. In order to avoid collisions and conflicts, follow these rules:

- Public attributes and methods, like `build()`, `self.package_folder`, are reserved for Conan. Don't use public members for custom fields or methods in the recipes.
- Use "protected" access for your own members, like `self._my_data` or `def _my_helper(self):`. Conan only reserves "protected" members starting with `_conan`.

---

Contents:

### 14.3.1 Attributes

#### name

This is a string, with a minimum of 2 and a maximum of 50 characters (though shorter names are recommended), that defines the package name. It will be the `<PkgName>/version@user/channel` of the package reference. It should match the following regex `^[a-zA-Z0-9_][a-zA-Z0-9_\+\.-]$`, so start with alphanumeric or underscore, then alphanumeric, underscore, +, ., - characters.

The name is only necessary for `export`-ing the recipe into the local cache (`export` and `create` commands), if they are not defined in the command line. It might take its value from an environment variable, or even any python code that defines it (e.g. a function that reads an environment variable, or a file from disk). However, the most common and suggested approach would be to define it in plain text as a constant, or provide it as command line arguments.

#### version

The version attribute will define the version part of the package reference: `PkgName/<version>@user/channel` It is a string, and can take any value, matching the same constraints as the `name` attribute. In case the version follows semantic versioning in the form `X.Y.Z-pre1+build2`, that value might be used for requiring this package through version ranges instead of exact versions.

The version is only strictly necessary for `export`-ing the recipe into the local cache (`export` and `create` commands), if they are not defined in the command line. It might take its value from an environment variable, or even any python code that defines it (e.g. a function that reads an environment variable, or a file from disk). Please note that this value might be used in the recipe in other places (as in `source()` method to retrieve code from elsewhere), making this value not constant means that it may evaluate differently in different contexts (e.g., on different machines or for different users) leading to unrepeatable or unpredictable results. The most common and suggested approach would be to define it in plain text as a constant, or provide it as command line arguments.

#### description

This is an optional, but strongly recommended text field, containing the description of the package, and any information that might be useful for the consumers. The first line might be used as a short description of the package.

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    description = """This is a Hello World library.
                     A fully featured, portable, C++ library to say Hello World in the␣
↪stdout,
                     with incredible iostreams performance"""
```

#### homepage

Use this attribute to indicate the home web page of the library being packaged. This is useful to link the recipe to further explanations of the library itself like an overview of its features, documentation, FAQ as well as other related information.

```
class EigenConan(ConanFile):
    name = "eigen"
    version = "3.3.4"
    homepage = "http://eigen.tuxfamily.org"
```

### url

It is possible, even typical, if you are packaging a third party lib, that you just develop the packaging code. Such code is also subject to change, often via collaboration, so it should be stored in a VCS like git, and probably put on GitHub or a similar service. If you do indeed maintain such a repository, please indicate it in the `url` attribute, so that it can be easily found.

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    url = "https://github.com/memsharded/hellopack.git"
```

The `url` is the url **of the package** repository, i.e. not necessarily the original source code. It is optional, but highly recommended, that it points to GitHub, Bitbucket or your preferred code collaboration platform. Of course, if you have the conanfile inside your library source, you can point to it, and afterwards use the `url` in your `source()` method.

This is a recommended, but not mandatory attribute.

### license

This field is intended for the license of the **target** source code and binaries, i.e. the code that is being packaged, not the `conanfile.py` itself. This info is used to be displayed by the **`conan info`** command and possibly other search and report tools.

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    license = "MIT"
```

This attribute can contain several, comma separated licenses. It is a text string, so it can contain any text, including hyperlinks to license files elsewhere.

However, we strongly recommend packagers of Open-Source projects to use [SPDX](https://spdx.org/) identifiers from the [SPDX license list](https://spdx.org/licenses/) instead of free-formed text. This will help people wanting to automate license compatibility checks, like consumers of your package, or you if your package has Open-Source dependencies.

This is a recommended, but not mandatory attribute.

### author

Intended to add information about the author, in case it is different from the Conan user. It is possible that the Conan user is the name of an organization, project, company or group, and many users have permissions over that account. In this case, the author information can explicitly define who is the creator/maintainer of the package

```
class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    author = "John J. Smith (john.smith@company.com)"
```

This is an optional attribute.

### topics

Topics provide a useful way to group related tags together and to quickly tell developers what a package is about. Topics also make it easier for customers to find your recipe. It could be useful to filter packages by topics or to reuse them in Bintray package page.

The `topics` attribute should be a tuple with the needed topics inside.

```
class ProtocInstallerConan(ConanFile):
    name = "protoc_installer"
    version = "0.1"
    topics = ("protocol-buffers", "protocol-compiler", "serialization", "rpc")
```

This is an optional attribute.

### user, channel

The fields `user` and `channel` can be accessed from within a `conanfile.py`. Though their usage is usually not encouraged, it could be useful in different cases, e.g. to define requirements with the same user and channel than the current package, which could be achieved with something like:

```
from conans import ConanFile

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"

    def requirements(self):
        self.requires("Say/0.1@%s/%s" % (self.user, self.channel))
```

Only package recipes that are in the conan local cache (i.e. "exported") have a user/channel assigned. For package recipes working in user space, there is no current user/channel. The properties `self.user` and `self.channel` will then look for environment variables `CONAN_USERNAME` and `CONAN_CHANNEL` respectively. If they are not defined, an error will be raised unless `default_user` and `default_channel` are declared.

**See also:**

FAQ: *Is there any recommendation regarding which <user> or <channel> to use in a reference?*

### default_user, default_channel

For package recipes working in the user space, with local methods like **`conan install .`** and **`conan build .`**, there is no current user/channel. If you are accessing to `self.user` or `self.channel` in your recipe, you need to declare the environment variables `CONAN_USERNAME` and `CONAN_CHANNEL` or you can set the attributes `default_user` and `default_channel`. You can also use python @properties:

```
from conans import ConanFile

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    default_user = "myuser"

    @property
    def default_channel(self):
        return "mydefaultchannel"
```

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```
    def requirements(self):
        self.requires("Pkg/0.1@%s/%s" % (self.user, self.channel))
```

### settings

There are several things that can potentially affect a package being created, i.e. the final package will be different (a different binary, for example), if some input is different.

Development project-wide variables, like the compiler, its version, or the OS itself. These variables have to be defined, and they cannot have a default value listed in the conanfile, as it would not make sense.

It is obvious that changing the OS produces a different binary in most cases. Changing the compiler or compiler version changes the binary too, which might have a compatible ABI or not, but the package will be different in any case.

For these reasons, the most common convention among Conan recipes is to distinguish binaries by the following four settings, which is reflected in the *conanfile.py* template used in the *conan new* command:

```
settings = "os", "compiler", "build_type", "arch"
```

When Conan generates a compiled binary for a package with a given combination of the settings above, it generates a unique ID for that binary by hashing the current values of these settings.

But what happens for example to **header only libraries**? The final package for such libraries is not binary and, in most cases it will be identical, unless it is automatically generating code. We can indicate that in the conanfile:

```
from conans import ConanFile

 class HelloConan(ConanFile):
     name = "Hello"
     version = "0.1"
     # We can just omit the settings attribute too
     settings = None

     def build(self):
         #empty too, nothing to build in header only
```

You can restrict existing settings and accepted values as well, by redeclaring the settings attribute:

```
class HelloConan(ConanFile):
    settings = {"os": ["Windows"],
        "compiler": {"Visual Studio": {"version": [11, 12]}},
        "arch": None}
```

In this example we have just defined that this package only works in Windows, with VS 10 and 11. Any attempt to build it in other platforms with other settings will throw an error saying so. We have also defined that the runtime (the MD and MT flags of VS) is irrelevant for us (maybe we using a universal one?). Using None as a value means, *maintain the original values* in order to avoid re-typing them. Then, "arch": None is totally equivalent to "arch": ["x86", "x86_64", "arm"] Check the reference or your ~/.conan/settings.yml file.

As re-defining the whole settings attribute can be tedious, it is sometimes much simpler to remove or tune specific fields in the `configure()` method. For example, if our package is runtime independent in VS, we can just remove that setting field:

```
settings = "os", "compiler", "build_type", "arch"

def configure(self):
    self.settings.compiler["Visual Studio"].remove("runtime")
```

### options

Conan packages recipes can generate different binary packages when different settings are used, but can also customize, per-package any other configuration that will produce a different binary.

A typical option would be being shared or static for a certain library. Note that this is optional, different packages can have this option, or not (like header-only packages), and different packages can have different values for this option, as opposed to settings, which typically have the same values for all packages being installed (though this can be controlled too, defining different settings for specific packages)

Options are defined in package recipes as dictionaries of name and allowed values:

```
class MyPkg(ConanFile):
    ...
    options = {"shared": [True, False]}
```

Options are defined as a python dictionary inside the `ConanFile` where each key must be a string with the identifier of the option and the value be a list with all the possible option values:

```
class MyPkg(ConanFile):
    ...
    options = {"shared": [True, False],
               "option1": ["value1", "value2"],}
```

Values for each option can be typed or plain strings, and there is a special value, `ANY`, for options that can take any value.

The attribute `default_options` has the purpose of defining the default values for the options if the consumer (consuming recipe, project, profile or the user through the command line) does not define them. It is worth noticing that **an uninitialized option will get the value `None` and it will be a valid value if its contained in the list of valid values**. This attribute should be defined as a python dictionary too, although other definitions could be valid for legacy reasons.

```
class MyPkg(ConanFile):
    ...
    options = {"shared": [True, False],
               "option1": ["value1", "value2"],
               "option2": "ANY"}
    default_options = {"shared": True,
                       "option1": "value1",
                       "option2": 42}

    def build(self):
        shared = "-DBUILD_SHARED_LIBS=ON" if self.options.shared else ""
        cmake = CMake(self)
        self.run("cmake . %s %s" % (cmake.command_line, shared))
        ...
```

**Tip:** You can inspect available package options reading the package recipe, which can be done with the command **`conan get MyPkg/0.1@user/channel`**.

As we mentioned before, values for options in a recipe can be defined using different ways, let's go over all of them for the example recipe `MyPkg` defined above:

- Using the attribute `default_options` in the recipe itself.
- In the `default_options` of a recipe that requires this one: the values defined here will override the default ones in the recipe.

```
class OtherPkg(ConanFile):
    requires = "MyPkg/0.1@user/channel"
    default_options = {"MyPkg:shared": False}
```

  Of course, this will work in the same way working with a *conanfile.txt*:

```
[requires]
MyPkg/0.1@user/channel

[options]
MyPkg:shared=False
```

- It is also possible to define default values for the options of a recipe using *profiles*. They will apply whenever that recipe is used:

```
# file "myprofile"
# use it as $ conan install -pr=myprofile
[settings]
setting=value

[options]
MyPkg:shared=False
```

- Last way of defining values for options, with the highest priority over them all, is to pass these values using the command argument **-o** in the command line:

```
$ conan install . -o MyPkg:shared=True -o OtherPkg:option=value
```

Values for options can be also conditionally assigned (or even deleted) in the methods `configure()` and `config_options()`, the *corresponding section* has examples documenting these use cases. However, conditionally assigning values to options can have it drawbacks as it is explained in the *mastering section*.

One important notice is how these options values are evaluated and how the different conditionals that we can implement in Python will behave. As seen before, values for options can be defined in Python code (assigning a dictionary to `default_options`) or through strings (using a `conanfile.txt`, a profile file, or through the command line). In order to provide a consistent implementation take into account these considerations:

- Evaluation for the typed value and the string one is the same, so all these inputs would behave the same:
  - `default_options = {"shared": True, "option": None}`
  - `default_options = {"shared": "True", "option": "None"}`
  - `MyPkg:shared=True`, `MyPkg:option=None` on profiles, command line or *conanfile.txt*
- **Implicit conversion to boolean is case insensitive**, so the expression `bool(self.options.option)`:
  - equals `True` for the values `True`, `"True"` and `"true"`, and any other value that would be evaluated the same way in Python code.
  - equals `False` for the values `False`, `"False"` and `"false"`, also for the empty string and for `0` and `"0"` as expected.

- Comparison using `is` is always equals to `False` because the types would be different as the option value is encapsulated inside a Conan class.
- Explicit comparisons with the == symbol **are case sensitive**, so:
  - `self.options.option = "False"` satisfies `assert self.options.option == False`, `assert self.options.option == "False"`, but `assert self.options.option != "false"`.
- A different behavior has `self.options.option = None`, because `assert self.options.option != None`.

### default_options

As you have seen in the examples above, recipe's default options are declared as a dictionary with the initial desired value of the options. However, you can also specify default option values of the required dependencies:

```
class OtherPkg(ConanFile):
    requires = "Pkg/0.1@user/channel"
    default_options = {"Pkg:pkg_option": "value"}
```

And it also works with default option values of conditional required dependencies:

```
class OtherPkg(ConanFile):
    default_options = {"Pkg:pkg_option": "value"}

    def requirements(self):
        if self.settings.os != "Windows":
            self.requires("Pkg/0.1@user/channel")
```

For this example running in Windows, the *default_options* for the *Pkg/0.1@user/channel* will be ignored, they will only be used on every other OS.

You can also set the options conditionally to a final value with `config_options()` instead of using `default_options`:

```
class OtherPkg(ConanFile):
    settings = "os", "arch", "compiler", "build_type"
    options = {"some_option": [True, False]}
    # Do NOT declare 'default_options', use 'config_options()'

    def config_options(self):
        if self.options.some_option == None:
            if self.settings.os == 'Android':
                self.options.some_option = True
            else:
                self.options.some_option = False
```

**Important:** Setting options conditionally without a default value works only to define a default value if not defined in command line. However, doing it this way will assign a final value to the option and not an initial one, so those option values will not be overridable from downstream dependent packages.

**See also:**

Read more about the *config_options()* method.

### requires

Specify package dependencies as a list of other packages:

```
class MyLibConan(ConanFile):
    requires = "Hello/1.0@user/stable", "OtherLib/2.1@otheruser/testing"
```

You can specify further information about the package requirements:

```
class MyLibConan(ConanFile):
    requires = (("Hello/0.1@user/testing"),
                ("Say/0.2@dummy/stable", "override"),
                ("Bye/2.1@coder/beta", "private"))
```

Requirements can be complemented by 2 different parameters:

**private**: a dependency can be declared as private if it is going to be fully embedded and hidden from consumers of the package. Typical examples could be a header only library which is not exposed through the public interface of the package, or the linking of a static library inside a dynamic one, in which the functionality or the objects of the linked static library are not exposed through the public interface of the dynamic library.

**override**: packages can define overrides of their dependencies, if they require the definition of specific versions of the upstream required libraries, but not necessarily direct dependencies. For example, a package can depend on A(v1.0), which in turn could conditionally depend on Zlib(v2), depending on whether the compression is enabled or not. Now, if you want to force the usage of Zlib(v3) you can:

```
class HelloConan(ConanFile):
    requires = ("A/1.0@user/stable", ("Zlib/3.0@other/beta", "override"))
```

This **will not introduce a new dependency**, it will just change Zlib v2 to v3 if A actually requires it. Otherwise Zlib will not be a dependency of your package.

### version ranges

The syntax is using brackets:

```
class HelloConan(ConanFile):
    requires = "Pkg/[>1.0,<1.8]@user/stable"
```

Expressions are those defined and implemented by [python node-semver](https://pypi.org/project/node-semver/), but using a comma instead of spaces. Accepted expressions would be:

```
>1.1,<2.1     # In such range
2.8           # equivalent to =2.8
~=3.0         # compatible, according to semver
>1.1 || 0.8   # conditions can be OR'ed
```

Go to *Mastering/Version Ranges* if you want to learn more about version ranges.

### build_requires

Build requirements are requirements that are only installed and used when the package is built from sources. If there is an existing pre-compiled binary, then the build requirements for this package will not be retrieved.

They can be specified as a comma separated tuple in the package recipe:

```
class MyPkg(ConanFile):
    build_requires = "ToolA/0.2@user/testing", "ToolB/0.2@user/testing"
```

Read more: *Build requiremens*

### exports

If a package recipe `conanfile.py` requires other external files, like other python files that it is importing (python importing), or maybe some text file with data it is reading, those files must be exported with the `exports` field, so they are stored together, side by side with the `conanfile.py` recipe.

The `exports` field can be one single pattern, like `exports="*"`, or several inclusion patterns. For example, if we have some python code that we want the recipe to use in a `helpers.py` file, and have some text file, `info.txt`, we want to read and display during the recipe evaluation we would do something like:

```
exports = "helpers.py", "info.txt"
```

Exclude patterns are also possible, with the `!` prefix:

```
exports = "*.py", "!*tmp.py"
```

This is an optional attribute, only to be used if the package recipe requires these other files for evaluation of the recipe.

### exports_sources

There are 2 ways of getting source code to build a package. Using the `source()` recipe method and using the `exports_sources` field. With `exports_sources` you specify which sources are required, and they will be exported together with the **conanfile.py**, copying them from your folder to the local conan cache. Using `exports_sources` the package recipe can be self-contained, containing the source code like in a snapshot, and then not requiring downloading or retrieving the source code from other origins (git, download) with the `source()` method when it is necessary to build from sources.

The `exports_sources` field can be one single pattern, like `exports_sources="*"`, or several inclusion patterns. For example, if we have the source code inside "include" and "src" folders, and there are other folders that are not necessary for the package recipe, we could do:

```
exports_sources = "include*", "src*"
```

Exclude patterns are also possible, with the `!` prefix:

```
exports_sources = "include*", "src*", "!src/build/*"
```

This is an optional attribute, used typically when `source()` is not specified. The main difference with `exports` is that `exports` files are always retrieved (even if pre-compiled packages exist), while `exports_sources` files are only retrieved when it is necessary to build a package from sources.

### generators

Generators specify which is the output of the `install` command in your project folder. By default, a *conanbuildinfo.txt* file is generated, but you can specify different generators and even use more than one.

```
class MyLibConan(ConanFile):
    generators = "cmake", "gcc"
```

Check the full *generators list*.

### should_configure, should_build, should_install, should_test

Read only variables defaulted to `True`.

These variables allow you to control the build stages of a recipe during a **`conan build`** command with the optional arguments **`--configure/--build/--install/--test`**. For example, consider this `build()` method:

```
def build(self):
    cmake = CMake(self)
    cmake.configure()
    cmake.build()
    cmake.install()
    cmake.test()
```

If nothing is specified, all four methods will be called. But using command line arguments, this can be changed:

```
$ conan build . --configure  # only run cmake.configure(). Other methods will do␣
↪nothing
$ conan build . --build      # only run cmake.build(). Other methods will do nothing
$ conan build . --install    # only run cmake.install(). Other methods will do nothing
$ conan build . --test       # only run cmake.test(). Other methods will do nothing
# They can be combined
$ conan build . -c -b # run cmake.configure() + cmake.build(), but not cmake.
↪install() nor cmake.test()
```

Autotools and Meson helpers already implement the same functionality. For other build systems, you can use these variables in the `build()` method:

```
def build(self):
    if self.should_configure:
        # Run my configure stage
    if self.should_build:
        # Run my build stage
    if self.should_install: # If my build has install, otherwise use package()
        # Run my install stage
    if self.should_test:
        # Run my test stage
```

Note that the `should_configure`, `should_build`, `should_install`, `should_test` variables will always be `True` while building in the cache and can be only modified for the local flow with **`conan build`**.

### build_policy

With the `build_policy` attribute the package creator can change the default conan's build behavior. The allowed `build_policy` values are:

- `missing`: If no binary package is found, Conan will build it without the need to invoke **`conan install --build missing`** option.
- `always`: The package will be built always, **retrieving each time the source code** executing the "source" method.

```
class PocoTimerConan(ConanFile):
    build_policy = "always" # "missing"
```

### short_paths

This attribute is specific to Windows, and ignored on other operating systems. It tells Conan to workaround the limitation of 260 chars in Windows paths.

---

**Important:** Since Windows 10 (ver. 10.0.14393), it is possible to enable long paths at the system level. Latest python 2.x and 3.x installers enable this by default. With the path limit removed both on the OS and on Python, the `short_paths` functionality becomes unnecessary, and may be disabled explicitly through the `CONAN_USER_HOME_SHORT` environment variable.

---

Enabling short paths management will "link" the `source` and `build` directories of the package to the drive root, something like `C:\.conan\tmpdir`. All the folder layout in the local cache is maintained.

Set `short_paths=True` in your *conanfile.py*:

```
from conans import ConanFile

class ConanFileTest(ConanFile):
    ...
    short_paths = True
```

**See also:**

There is an *environment variable* `CONAN_USE_ALWAYS_SHORT_PATHS` to globally enable this behavior for all packages.

### no_copy_source

The attribute `no_copy_source` tells the recipe that the source code will not be copied from the `source` folder to the `build` folder. This is mostly an optimization for packages with large source codebases, to avoid extra copies. It is **mandatory** that the source code must not be modified at all by the configure or build scripts, as the source code will be shared among all builds.

To be able to use it, the package recipe can access the `self.source_folder` attribute, which will point to the `build` folder when `no_copy_source=False` or not defined, and will point to the `source` folder when `no_copy_source=True`

When this attribute is set to True, the `package()` method will be called twice, one copying from the `source` folder and the other copying from the `build` folder.

### folders

In the package recipe methods, some attributes pointing to the relevant folders can be defined. Not all of them will be defined always, only in those relevant methods that might use them.

- `self.source_folder`: the folder in which the source code to be compiled lives. When a package is built in the conan local cache, by default it is the `build` folder, as the source code is copied from the `source` folder to the `build` folder, to ensure isolation and avoiding modifications of shared common source code among builds for different configurations. Only when `no_copy_source=True` this folder will actually point to the package `source` folder in the local cache.
- `self.build_folder`: the folder in which the build is being done
- `self.install_folder`: the folder in which the install has output the generator files, by default, and always in the local cache, is the same `self.build_folder`

- `self.package_folder`: the folder to copy the final artifacts for the binary package

When executing local conan commands (for a package not in the local cache, but in user folder), those fields would be pointing to the corresponding local user folder.

### cpp_info

**Important:** This attribute is only defined inside `package_info()` method being *None* elsewhere.

The `self.cpp_info` is responsible for storing all the information needed by consumers of a package: include directories, library names, library paths... There are some default values that will be applied automatically if not indicated otherwise.

This object should be filled in `package_info()` method.

| NAME | DESCRIPTION |
|---|---|
| self.cpp_info.includedirs | Ordered list with include paths. Defaulted to `["include"]` |
| self.cpp_info.libdirs | Ordered list with lib paths. Defaulted to `["lib"]` |
| self.cpp_info.resdirs | Ordered list of resource (data) paths. Defaulted to `["res"]` |
| self.cpp_info.bindirs | Ordered list with include paths. Defaulted to `["bin"]` |
| self.cpp_info.builddirs | Ordered list with build scripts directory paths. Defaulted to `[""]` (Package folder directory) CMake generators will search in these dirs for files like *findXXX.cmake* |
| self.cpp_info.libs | Ordered list with the library names, Defaulted to `[]` (empty) |
| self.cpp_info.defines | Preprocessor definitions. Defaulted to `[]` (empty) |
| self.cpp_info.cflags | Ordered list with pure C flags. Defaulted to `[]` (empty) |
| self.cpp_info.cppflags | Ordered list with C++ flags. Defaulted to `[]` (empty) |
| self.cpp_info.sharedlinkflags | Ordered list with linker flags (shared libs). Defaulted to `[]` (empty) |
| self.cpp_info.exelinkflags | Ordered list with linker flags (executables). Defaulted to `[]` (empty) |
| self.cpp_info.rootpath | Filled with the root directory of the package, see `deps_cpp_info` |

The paths of the directories in the directory variables indicated above are relative to the *self.package_folder* directory.

**See also:**

Read *package_info()* for more info.

### deps_cpp_info

Contains the `cpp_info` object of the requirements of the recipe. In addition of the above fields, there are also properties to obtain the absolute paths:

| NAME | DESCRIPTION |
|---|---|
| self.cpp_info.include_paths | Same as `includedirs` but transformed to absolute paths |
| self.cpp_info.lib_paths | Same as `libdirs` but transformed to absolute paths |
| self.cpp_info.bin_paths | Same as `bindirs` but transformed to absolute paths |
| self.cpp_info.build_paths | Same as `builddirs` but transformed to absolute paths |
| self.cpp_info.res_paths | Same as `resdirs` but transformed to absolute paths |

To get a list of all the dependency names from `deps_cpp_info`, you can call the *deps* member:

```
class PocoTimerConan(ConanFile):
    ...
    def build(self):
        # deps is a list of package names: ["Poco", "zlib", "OpenSSL"]
        deps = self.deps_cpp_info.deps
```

It can be used to get information about the dependencies, like used compilation flags or the root folder of the package:

```
class PocoTimerConan(ConanFile):
    ...
    requires = "zlib/1.2.11@conan/stable", "OpenSSL/1.0.2l@conan/stable"
    ...

    def build(self):
        # Get the directory where zlib package is installed
        self.deps_cpp_info["zlib"].rootpath

        # Get the absolute paths to zlib include directories (list)
        self.deps_cpp_info["zlib"].include_paths

        # Get the sharedlinkflags property from OpenSSL package
        self.deps_cpp_info["OpenSSL"].sharedlinkflags
```

### env_info

This attribute is only defined inside `package_info()` method, being None elsewhere, so please use it only inside this method.

The `self.env_info` object can be filled with the environment variables to be declared in the packages reusing the recipe.

**See also:**

Read *package_info() method docs* for more info.

### deps_env_info

You can access to the declared environment variables of the requirements of the recipe.

**Note:** The environment variables declared in the requirements of a recipe are automatically applied and it can be accessed with the python `os.environ` dictionary. Nevertheless if you want to access to the variable declared by some specific requirement you can use the `self.deps_env_info` object.

```
import os
```

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```
class RecipeConan(ConanFile):
    ...
    requires = "package1/1.0@conan/stable", "package2/1.2@conan/stable"
    ...

    def build(self):
        # Get the SOMEVAR environment variable declared in the "package1"
        self.deps_env_info["package1"].SOMEVAR

        # Access to the environment variables globally
        os.environ["SOMEVAR"]
```

### user_info

This attribute is only defined inside `package_info()` method, being None elsewhere, so please use it only inside this method.

The `self.user_info` object can be filled with any custom variable to be accessed in the packages reusing the recipe.

**See also:**

Read *package_info() method docs* for more info.

### deps_user_info

You can access the declared `user_info.XXX` variables of the requirements through the `self.deps_user_info` object like this:

```
import os

class RecipeConan(ConanFile):
    ...
    requires = "package1/1.0@conan/stable"
    ...

    def build(self):
        self.deps_user_info["package1"].SOMEVAR
```

### info

Object used to control the unique ID for a package. Check the *package_id()* to see the details of the `self.info` object.

### apply_env

When `True` (Default), the values from `self.deps_env_info` (corresponding to the declared `env_info` in the `requires` and `build_requires`) will be automatically applied to the `os.environ`.

Disable it setting `apply_env` to False if you want to control by yourself the environment variables applied to your recipes.

You can apply manually the environment variables from the requires and build_requires:

```
import os
from conans import tools

class RecipeConan(ConanFile):
    apply_env = False

    def build(self):
        with tools.environment_append(self.env):
            # The same if we specified apply_env = True
            pass
```

### in_local_cache

A boolean attribute useful for conditional logic to apply in user folders local commands. It will return *True* if the conanfile resides in the local cache ( we are installing the package) and *False* if we are running the conanfile in a user folder (local Conan commands).

```
import os

class RecipeConan(ConanFile):
    ...

    def build(self):
        if self.in_local_cache:
            # we are installing the package
        else:
            # we are building the package in a local directory
```

### develop

A boolean attribute useful for conditional logic. It will be `True` if the package is created with **`conan create`**, or if the *conanfile.py* is in user space:

```
class RecipeConan(ConanFile):

    def build(self):
        if self.develop:
            self.output.info("Develop mode")
```

It can be used for conditional logic in other methods too, like `requirements()`, `package()`, etc.

This recipe will output "Develop mode" if:

```
$ conan create . user/testing
# or
$ mkdir build && cd build && conan install ..
$ conan build ..
```

But it will not output that when it is a transitive requirement or installed with **`conan install`**.

### keep_imports

Just before the `build()` method is executed, if the conanfile has an `imports()` method, it is executed into the build folder, to copy binaries from dependencies that might be necessary for the `build()` method to work. After the

method finishes, those copied (imported) files are removed, so they are not later unnecessarily repackaged.

This behavior can be avoided declaring the `keep_imports=True` attribute. This can be useful, for example to *repackage artifacts*

#### scm

Used to clone/checkout a repository. It is a dictionary with the following possible values:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
     scm = {
        "type": "git",
        "subfolder": "hello",
        "url": "https://github.com/memsharded/hello.git",
        "revision": "static_shared"
     }
    ...
```

- **type** (Required): Currently only `git` and `svn` are supported. Others can be added eventually.
- **url** (Required): URL of the remote or `auto` to capture the remote from the local working copy. When type is `svn` it can contain the peg_revision.
- **revision** (Required): id of the revision or `auto` to capture the current working copy one. When type is `git`, it can also be the branch name or a tag.
- **subfolder** (Optional, Defaulted to `.`): A subfolder where the repository will be cloned.
- **username** (Optional, Defaulted to `None`): When present, it will be used as the login to authenticate with the remote.
- **password** (Optional, Defaulted to `None`): When present, it will be used as the password to authenticate with the remote.
- **verify_ssl** (Optional, Defaulted to `True`): Verify SSL certificate of the specified **url**.
- **submodule (Optional, Defaulted to `None`):**
  - `shallow`: Will sync the git submodules using `submodule sync`
  - `recursive`: Will sync the git submodules using `submodule sync --recursive`

To know more about the usage of `scm` check:

- *Creating packages/Recipe and sources in a different repo*
- *Creating packages/Recipe and sources in the same repo*

### 14.3.2 Methods

#### source()

Method used to retrieve the source code from any other external origin like github using `$ git clone` or just a regular download.

For example, "exporting" the source code files, together with the *conanfile.py* file, can be handy if the source code is not under version control. But if the source code is available in a repository, you can directly get it from there:

```
from conans import ConanFile

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"

    def source(self):
        self.run("git clone https://github.com/memsharded/hello.git")
        # You can also change branch, commit or whatever
        # self.run("cd hello && git checkout 2fe5...")
        #
        # Or using the Git class:
        # git = tools.Git(folder="hello")
        # git.clone("https://github.com/memsharded/hello.git", "static_shared")
```

This will work, as long as git is in your current path (so in Win you probably want to run things in msysgit, cmder, etc). You can also use another VCS or direct download/unzip. For that purpose, we have provided some helpers, but you can use your own code or origin as well. This is a snippet of the conanfile of the Poco library:

```
from conans import ConanFile
from conans.tools import download, unzip, check_md5, check_sha1, check_sha256
import os
import shutil

class PocoConan(ConanFile):
    name = "Poco"
    version = "1.6.0"

    def source(self):
        zip_name = "poco-1.6.0-release.zip"
        download("https://github.com/pocoproject/poco/archive/poco-1.6.0-release.zip",
↪ zip_name)
        # check_md5(zip_name, "51e11f2c02a36689d6ed655b6fff9ec9")
        # check_sha1(zip_name, "8d87812ce591ced8ce3a022beec1df1c8b2fac87")
        # check_sha256(zip_name,
↪"653f983c30974d292de58444626884bee84a2731989ff5a336b93a0fef168d79")
        unzip(zip_name)
        shutil.move("poco-poco-1.6.0-release", "poco")
        os.unlink(zip_name)
```

The download, unzip utilities can be imported from conan, but you can also use your own code here to retrieve source code from any origin. You can even create packages for pre-compiled libraries you already have, even if you don't have the source code. You can download the binaries, skip the `build()` method and define your `package()` and `package_info()` accordingly.

You can also use `check_md5()`, `check_sha1()` and `check_sha256()` from the *tools* module to verify that a package is downloaded correctly.

---

**Note:** It is very important to recall that the `source()` method will be executed just once, and the source code will be shared for all the package builds. So it is not a good idea to conditionally use settings or options to make changes or patches on the source code. Maybe the only setting that makes sense is the OS `self.settings.os`, if not doing cross-building, for example to retrieve different sources:

```
def source(self):
    if platform.system() == "Windows":
```

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```
        # download some Win source zip
    else:
        # download sources from Nix systems in a tgz
```

If you need to patch the source code or build scripts differently for different variants of your packages, you can do it in the `build()` method, which uses a different folder and source code copy for each variant.

### build()

This method is used to build the source code of the recipe using the desired commands. You can use your command line tools to invoke your build system or any of the build helpers provided with Conan.

```
def build(self):
    cmake = CMake(self)
    self.run("cmake . %s" % (cmake.command_line))
    self.run("cmake --build . %s" % cmake.build_config)
```

### Build helpers

You can use these classes to prepare your build system's command invocation:

- **CMake**: Prepares the invocation of cmake command with your settings.
- **AutoToolsBuildEnvironment**: If you are using configure/Makefile to build your project you can use this helper. Read more: *Building with Autotools*.
- **MSBuild**: If you are using Visual Studio compiler directly to build your project you can use this helper *MSBuild()*. For lower level control, the **VisualStudioBuildEnvironment** can also be used: *VisualStudioBuildEnvironment*.

### (Unit) Testing your library

We have seen how to run package tests with conan, but what if we want to run full unit tests on our library before packaging, so that they are run for every build configuration? Nothing special is required here. We can just launch the tests from the last command in our `build()` method:

```
def build(self):
    cmake = CMake(self)
    cmake.configure()
    cmake.build()
    # here you can run CTest, launch your binaries, etc
    cmake.test()
```

### package()

The actual creation of the package, once that it is built, is done in the `package()` method. Using the `self.copy()` method, artifacts are copied from the build folder to the package folder.

The syntax of `self.copy` inside `package()` is as follows:

```
self.copy(pattern, dst="", src="", keep_path=True, symlinks=None, excludes=None,␣
↪ignore_case=False)
```

**Parameters:**

- **pattern** (Required): A pattern following fnmatch syntax of the files you want to copy, from the build to the package folders. Typically something like `*.lib` or `*.h`.
- **src** (Optional, Defaulted to `""`): The folder where you want to search the files in the build folder. If you know that your libraries when you build your package will be in *build/lib*, you will typically use `build/lib` in this parameter. Leaving it empty means the root build folder in local cache.
- **dst** (Optional, Defaulted to `""`): Destination folder in the package. They will typically be `include` for headers, `lib` for libraries and so on, though you can use any convention you like. Leaving it empty means the root package folder in local cache.
- **keep_path** (Optional, Defaulted to `True`): Means if you want to keep the relative path when you copy the files from the **src** folder to the **dst** one. Typically headers are packaged with relative path.
- **symlinks** (Optional, Defaulted to `None`): Set it to True to activate symlink copying, like typical lib.so->lib.so.9.
- **excludes** (Optional, Defaulted to `None`): Single pattern or a tuple of patterns to be excluded from the copy. If a file matches both the include and the exclude pattern, it will be excluded.
- **ignore_case** (Optional, Defaulted to `False`): If enabled, it will do a case-insensitive pattern matching.

For example:

```
self.copy("*.h", "include", "build/include") #keep_path default is True
```

The final path in the package will be: `include/mylib/path/header.h`, and as the *include* is usually added to the path, the includes will be in the form: `#include "mylib/path/header.h"` which is something desired.

`keep_path=False` is something typically desired for libraries, both static and dynamic. Some compilers as MSVC, put them in paths as *Debug/x64/MyLib/Mylib.lib*. Using this option, we could write:

```
self.copy("*.lib", "lib", "", keep_path=False)
```

And it will copy the lib to the package folder *lib/Mylib.lib*, which can be linked easily.

---

**Note:** If you are using CMake and you have an install target defined in your CMakeLists.txt, you might be able to reuse it for this `package()` method. Please check *How to reuse cmake install for package() method*.

---

This method copies files from build/source folder to the package folder depending on two situations:

- **Build folder and source folder are the same**: Normally during **`conan create`** source folder content is copied to the build folder. In this situation `src` parameter of `self.copy()` will point to the build folder in the local cache.
- **Build folder is different from source folder**: When *developing a package recipe* and source and build folder are different (**`conan package . --source-folder=source --build-folder=build`**) or when *no_copy_source* is defined, `package()` method is called twice: One will copy from the source folder (`src` parameter of `self.copy()` will point to the source folder), and the other will copy from the build folder (`src` parameter of `self.copy()` will point to the build folder).

### package_info()

### cpp_info

Each package has to specify certain build information for its consumers. This can be done in the `cpp_info` attribute within the `package_info()` method.

The `cpp_info` attribute has the following properties you can assign/append to:

```
self.cpp_info.includedirs = ['include']  # Ordered list of include paths
self.cpp_info.libs = []  # The libs to link against
self.cpp_info.libdirs = ['lib']  # Directories where libraries can be found
self.cpp_info.resdirs = ['res']  # Directories where resources, data, etc can be found
self.cpp_info.bindirs = ['bin']  # Directories where executables and shared libs can␣
↪be found
self.cpp_info.defines = []  # preprocessor definitions
self.cpp_info.cflags = []  # pure C flags
self.cpp_info.cppflags = []  # C++ compilation flags
self.cpp_info.sharedlinkflags = []  # linker flags
self.cpp_info.exelinkflags = []  # linker flags
```

- **includedirs**: List of relative paths (starting from the package root) of directories where headers can be found. By default it is initialized to `['include']`, and it is rarely changed.
- **libs**: Ordered list of libs the client should link against. Empty by default, it is common that different configurations produce different library names. For example:

```
def package_info(self):
    if not self.settings.os == "Windows":
        self.cpp_info.libs = ["libzmq-static.a"] if self.options.static else ["libzmq.
↪so"]
    else:
        ...
```

- **libdirs**: List of relative paths (starting from the package root) of directories in which to find library object binaries (*.lib, *.a, *.so, *.dylib). By default it is initialized to `['lib']`, and it is rarely changed.
- **resdirs**: List of relative paths (starting from the package root) of directories in which to find resource files (images, xml, etc). By default it is initialized to `['res']`, and it is rarely changed.
- **bindirs**: List of relative paths (starting from the package root) of directories in which to find library runtime binaries (like Windows .dlls). By default it is initialized to `['bin']`, and it is rarely changed.
- **defines**: Ordered list of preprocessor directives. It is common that the consumers have to specify some sort of defines in some cases, so that including the library headers matches the binaries:
- **cflags**, **cppflags**, **sharedlinkflags**, **exelinkflags**: List of flags that the consumer should activate for proper behavior. Usage of C++11 could be configured here, for example, although it is true that the consumer may want to do some flag processing to check if different dependencies are setting incompatible flags (c++11 after c++14).

```
if self.options.static:
    if self.settings.compiler == "Visual Studio":
        self.cpp_info.libs.append("ws2_32")
    self.cpp_info.defines = ["ZMQ_STATIC"]

    if not self.settings.os == "Windows":
        self.cpp_info.cppflags = ["-pthread"]
```

Note that due to the way that some build systems, like CMake, manage forward and back slashes, it might be more robust passing flags for Visual Studio compiler with dash instead. Using `"/NODEFAULTLIB:MSVCRT"`, for example, might fail when using CMake targets mode, so the following is preferred and works both in the global and targets mode of CMake:

```
def package_info(self):
    self.cpp_info.exelinkflags = ["-NODEFAULTLIB:MSVCRT",
                                  "-DEFAULTLIB:LIBCMT"]
```

If your recipe has requirements, you can access to your requirements `cpp_info` as well using the `deps_cpp_info` object.

```
class OtherConan(ConanFile):
    name = "OtherLib"
    version = "1.0"
    requires = "MyLib/1.6.0@conan/stable"

    def build(self):
        self.output.warn(self.deps_cpp_info["MyLib"].libdirs)
```

**Note:** Please take into account that defining `self.cpp_info.bindirs` directories, does not have any effect on system paths, PATH environment variable, nor will be directly accessible by consumers. `self.cpp_info` information is translated to build-systems information via generators, for example for CMake, it will be a variable in `conanbuildinfo.cmake`. If you want a package to make accessible its executables to its consumers, you have to specify it with `self.env_info` as described in *env_info*.

### env_info

Each package can also define some environment variables that the package needs to be reused. It's specially useful for *installer packages*, to set the path with the "bin" folder of the packaged application. This can be done in the `env_info` attribute within the `package_info()` method.

```
self.env_info.path.append("ANOTHER VALUE") # Append "ANOTHER VALUE" to the path␣
↪variable
self.env_info.othervar = "OTHER VALUE" # Assign "OTHER VALUE" to the othervar variable
self.env_info.thirdvar.append("some value") # Every variable can be set or appended a␣
↪new value
```

One of the most typical usages for the PATH environment variable, would be to add the current binary package directories to the path, so consumers can use those executables easily:

```
# assuming the binaries are in the "bin" subfolder
self.env_info.PATH.append(os.path.join(self.package_folder, "bin"))
```

The *virtualenv* generator will use the `self.env_info` variables to prepare a script to activate/deactivate a virtual environment. However, this could be directly done using the *virtualrunenv* generator.

They will be automatically applied before calling the consumer *conanfile.py* methods `source()`, `build()`, `package()` and `imports()`.

If your recipe has requirements, you can access to your requirements `env_info` as well using the `deps_env_info` object.

```
class OtherConan(ConanFile):
    name = "OtherLib"
    version = "1.0"
    requires = "MyLib/1.6.0@conan/stable"

    def build(self):
        self.output.warn(self.deps_env_info["MyLib"].othervar)
```

### user_info

If you need to declare custom variables not related with C/C++ (`cpp_info`) and the variables are not environment variables (`env_info`), you can use the `self.user_info` object.

Currently only the `cmake`, `cmake_multi` and `txt` generators supports `user_info` variables.

```
class MyLibConan(ConanFile):
    name = "MyLib"
    version = "1.6.0"

    # ...

    def package_info(self):
        self.user_info.var1 = 2
```

For the example above, in the `cmake` and `cmake_multi` generators, a variable `CONAN_USER_MYLIB_var1` will be declared. If your recipe has requirements, you can access to your requirements `user_info` using the `deps_user_info` object.

```
class OtherConan(ConanFile):
    name = "OtherLib"
    version = "1.0"
    requires = "MyLib/1.6.0@conan/stable"

    def build(self):
        self.out.warn(self.deps_user_info["MyLib"].var1)
```

**Important:** Both `env_info` and `user_info` objects store information in a "key <-> value" form and the values are always considered strings. This is done for serialization purposes to *conanbuildinfo.txt* files and to avoid the deserialization of complex structures. It is up to the consumer to convert the string to the expected type:

```
# In a dependency
self.user_info.jars="jar1.jar, jar2.jar, jar3.jar"  # Use a string, not a list
...

# In the dependent conanfile
jars = self.deps_user_info["Pkg"].jars
jar_list = jars.replace(" ", "").split(",")
```

### configure(), config_options()

If the package options and settings are related, and you want to configure either, you can do so in the `configure()` and `config_options()` methods.

```
class MyLibConan(ConanFile):
    name = "MyLib"
    version = "2.5"
    settings = "os", "compiler", "build_type", "arch"
    options = {"static": [True, False],
               "header_only": [True False]}

    def configure(self):
        # If header only, the compiler, etc, does not affect the package!
        if self.options.header_only:
            self.settings.clear()
            self.options.remove("static")
```

The package has 2 options set, to be compiled as a static (as opposed to shared) library, and also not to involve any builds, because header-only libraries will be used. In this case, the settings that would affect a normal build, and even the other option (static vs shared) do not make sense, so we just clear them. That means, if someone consumes MyLib with the `header_only=True` option, the package downloaded and used will be the same, irrespective of the OS, compiler or architecture the consumer is building with.

You can also restrict the settings used deleting any specific one. For example, it is quite common for C libraries to delete the `libcxx` as your library does not depend on any C++ standard library:

```
def configure(self):
    del self.settings.compiler.libcxx
```

The most typical usage would be the one with `configure()` while `config_options()` should be used more sparingly. `config_options()` is used to configure or constraint the available options in a package, **before** they are given a value. So when a value is tried to be assigned it will raise an error. For example, let's suppose that a certain package library cannot be built as shared library in Windows, it can be done:

```
def config_options(self):
    if self.settings.os == "Windows":
        del self.options.shared
```

This will be executed before the actual assignment of `options` (then, such `options` values cannot be used inside this function), so the command **`conan install -o Pkg:shared=True`** will raise an exception in Windows saying that `shared` is not an option for such package.

### Invalid configuration

Conan allows the recipe creator to declare invalid configurations, those that are known not to work with the library being packaged. There is an especial kind of exception that can be raised from the `configure()` method to state this situation: `conans.errors.ConanInvalidConfiguration`. Here it is an example of a recipe for a library that doesn't support Windows operating system:

```
def configure(self):
    if self.settings.os == "Windows":
        raise ConanInvalidConfiguration("Library MyLib is only supported for Windows")
```

This exception will be propagated and Conan application will exit with the error code `6`.

### requirements()

Besides the `requires` field, more advanced requirement logic can be defined in the `requirements()` optional method, using for example values from the package `settings` or `options`:

```
def requirements(self):
    if self.options.myoption:
        self.requires("zlib/1.2@drl/testing")
    else:
        self.requires("opencv/2.2@drl/stable")
```

This is a powerful mechanism for handling **conditional dependencies**.

When you are inside the method, each call to `self.requires()` will add the corresponding requirement to the current list of requirements. It also has optional parameters that allow defining the special cases, as is shown below:

```
def requirements(self):
    self.requires("zlib/1.2@drl/testing", private=True, override=False)
```

**`self.requires()` parameters:**

- **override** (Optional, Defaulted to `False`): True means that this is not an actual requirement, but something to be passed upstream and override possible existing values.
- **private** (Optional, Defaulted to `False`): True means that this requirement will be somewhat embedded (like a static lib linked into a shared lib), so it is not required to link.

### build_requirements()

Build requirements are requirements that are only installed and used when the package is built from sources. If there is an existing pre-compiled binary, then the build requirements for this package will not be retrieved.

This method is useful for defining conditional build requirements, for example:

```
class MyPkg(ConanFile):

    def build_requirements(self):
        if self.settings.os == "Windows":
            self.build_requires("ToolWin/0.1@user/stable")
```

**See also:**

*Build requirements*

### system_requirements()

It is possible to install system-wide packages from conan. Just add a `system_requirements()` method to your conanfile and specify what you need there.

For a special use case you can use also `conans.tools.os_info` object to detect the operating system, version and distribution (linux):

- `os_info.is_linux`: True if Linux.
- `os_info.is_windows`: True if Windows.
- `os_info.is_macos`: True if macOS.
- `os_info.is_freebsd`: True if FreeBSD.
- `os_info.is_solaris`: True if SunOS.
- `os_info.os_version`: OS version.
- `os_info.os_version_name`: Common name of the OS (Windows 7, Mountain Lion, Wheezy...).

- `os_info.linux_distro`: Linux distribution name (None if not Linux).
- `os_info.bash_path`: Returns the absolute path to a bash in the system.
- `os_info.uname(options=None)`: Runs the "uname" command and returns the output. You can pass arguments with the *options* parameter.
- `os_info.detect_windows_subsystem()`: Returns "MSYS", "MSYS2", "CYGWIN" or "WSL" if any of these Windows subsystems are detected.

You can also use `SystemPackageTool` class, that will automatically invoke the right system package tool: **apt**, **yum**, **pkg**, **pkgutil**, **brew** and **pacman** depending on the system we are running.

```
from conans.tools import os_info, SystemPackageTool

def system_requirements(self):
    pack_name = None
    if os_info.linux_distro == "ubuntu":
        if os_info.os_version > "12":
            pack_name = "package_name_in_ubuntu_10"
        else:
            pack_name = "package_name_in_ubuntu_12"
    elif os_info.linux_distro == "fedora" or os_info.linux_distro == "centos":
        pack_name = "package_name_in_fedora_and_centos"
    elif os_info.is_macos:
        pack_name = "package_name_in_macos"
    elif os_info.is_freebsd:
        pack_name = "package_name_in_freebsd"
    elif os_info.is_solaris:
        pack_name = "package_name_in_solaris"

    if pack_name:
        installer = SystemPackageTool()
        installer.install(pack_name) # Install the package, will update the package␣
↪database if pack_name isn't already installed
```

On Windows, there is no standard package manager, however **choco** can be invoked as an optional:

```
from conans.tools import os_info, SystemPackageTool, ChocolateyTool

def system_requirements(self):
    if os_info.is_windows:
        pack_name = "package_name_in_windows"
        installer = SystemPackageTool(tool=ChocolateyTool()) # Invoke choco package␣
↪manager to install the package
        installer.install(pack_name)
```

### SystemPackageTool

```
def SystemPackageTool(tool=None)
```

Available tool classes: **AptTool**, **YumTool**, **BrewTool**, **PkgTool**, **PkgUtilTool**, **ChocolateyTool**, **PacManTool**.

**Methods:**

- **update**(): Updates the system package manager database. It's called automatically from the `install()` method by default.

- **install(packages, update=True, force=False)**: Installs the `packages` (could be a list or a string). If `update` is True it will execute `update()` first if it's needed. The packages won't be installed if they are already installed at least of `force` parameter is set to True. If `packages` is a list the first available package will be picked (short-circuit like logical **or**). **Note**: This list of packages is intended for providing **alternative** names for the same package, to account for small variations of the name for the same package in different distros. To install different packages, one call to `install()` per package is necessary.

The use of `sudo` in the internals of the `install()` and `update()` methods is controlled by the `CONAN_SYSREQUIRES_SUDO` environment variable, so if the users don't need sudo permissions, it is easy to opt-in/out.

Conan will keep track of the execution of this method, so that it is not invoked again and again at every Conan command. The execution is done per package, since some packages of the same library might have different system dependencies. If you are sure that all your binary packages have the same system requirements, just add the following line to your method:

```
def system_requirements(self):
    self.global_system_requirements=True
    if ...
```

### imports()

Importing files copies files from the local store to your project. This feature is handy for copying shared libraries (*dylib* in Mac, *dll* in Win) to the directory of your executable, so that you don't have to mess with your PATH to run them. But there are other use cases:

- Copy an executable to your project, so that it can be easily run. A good example is the **Google's protobuf** code generator.
- Copy package data to your project, like configuration, images, sounds... A good example is the **OpenCV** demo, in which face detection XML pattern files are required.

Importing files is also very convenient in order to redistribute your application, as many times you will just have to bundle your project's bin folder.

A typical `imports()` method for shared libs could be:

```
def imports(self):
   self.copy("*.dll", "", "bin")
   self.copy("*.dylib", "", "lib")
```

The `self.copy()` method inside `imports()` supports the following arguments:

```
def copy(pattern, dst="", src="", root_package=None, folder=False, ignore_case=False,␣
↪excludes=None, keep_path=True)
```

**Parameters:**

- **pattern** (Required): An fnmatch file pattern of the files that should be copied.
- **dst** (Optional, Defaulted to `""`): Destination local folder, with reference to current directory, to which the files will be copied.
- **src** (Optional, Defaulted to `""`): Source folder in which those files will be searched. This folder will be stripped from the dst parameter. E.g., *lib/Debug/x86*
- **root_package** (Optional, Defaulted to *all packages in deps*): An fnmatch pattern of the package name ("OpenCV", "Boost") from which files will be copied.

- **folder** (Optional, Defaulted to `False`): If enabled, it will copy the files from the local cache to a subfolder named as the package containing the files. Useful to avoid conflicting imports of files with the same name (e.g. License).
- **ignore_case** (Optional, Defaulted to `False`): If enabled, it will do a case-insensitive pattern matching.
- **excludes** (Optional, Defaulted to `None`): Allows defining a list of patterns (even a single pattern) to be excluded from the copy, even if they match the main `pattern`.
- **keep_path** (Optional, Defaulted to `True`): Means if you want to keep the relative path when you copy the files from the **src** folder to the **dst** one. Useful to ignore (`keep_path=False`) path of *library.dll* files in the package it is imported from.

Example to collect license files from dependencies:

```
def imports(self):
    self.copy("license*", dst="licenses", folder=True, ignore_case=True)
```

If you want to be able to customize the output user directory to work with both the `cmake` and `cmake_multi` generators, then you can do:

```
def imports(self):
    dest = os.getenv("CONAN_IMPORT_PATH", "bin")
    self.copy("*.dll", dst=dest, src="bin")
    self.copy("*.dylib*", dst=dest, src="lib")
```

And then use, for example: **`conan install . -e CONAN_IMPORT_PATH=Release -g cmake_multi`**

When a conanfile recipe has an `imports()` method and it builds from sources, it will do the following:

- Before running `build()` it will execute `imports()` in the build folder, copying dependencies artifacts
- Run the `build()` method, which could use such imported binaries.
- Remove the copied (imported) artifacts after `build()` is finished.

You can use the *keep_imports* attribute to keep the imported artifacts, and maybe *repackage* them.

### package_id()

Creates a unique ID for the package. Default package ID is calculated using `settings`, `options` and `requires` properties. When a package creator specifies the values for any of those properties, it is telling that any value change will require a different binary package.

However, sometimes a package creator would need to alter the default behavior, for example, to have only one binary package for several different compiler versions. In that case you can set a custom `self.info` object implementing this method and the package ID will be computed with the given information:

```
def package_id(self):
    v = Version(str(self.settings.compiler.version))
    if self.settings.compiler == "gcc" and (v >= "4.5" and v < "5.0"):
        self.info.settings.compiler.version = "GCC 4 between 4.5 and 5.0"
```

Please, check the section *Defining Package ABI Compatibility* to get more details.

### self.info

This `self.info` object stores the information that will be used to compute the package ID.

This object can be manipulated to reflect the information you want in the computation of the package ID. For example, you can delete any setting or option:

```
def package_id(self):
    del self.info.settings.compiler
    del self.info.options.shared
```

### self.info.header_only()

The package will always be the same, irrespective of the OS, compiler or architecture the consumer is building with.

```
def package_id(self):
    self.info.header_only()
```

### self.info.vs_toolset_compatible() / self.info.vs_toolset_incompatible()

By default (`vs_toolset_compatible()` mode) Conan will generate the same binary package when the compiler is Visual Studio and the `compiler.toolset` matches the specified `compiler.version`. For example, if we install some packages specifying the following settings:

```
def package_id(self):
    self.info.vs_toolset_compatible()
    # self.info.vs_toolset_incompatible()
```

```
compiler="Visual Studio"
compiler.version=14
```

And then we install again specifying these settings:

```
compiler="Visual Studio"
compiler.version=15
compiler.toolset=v140
```

The compiler version is different, but Conan will not install a different package, because the used `toolchain` in both cases are considered the same. You can deactivate this default behavior using calling `self.info.vs_toolset_incompatible()`.

This is the relation of Visual Studio versions and the compatible toolchain:

| Visual Studio Version | Compatible toolset |
|---|---|
| 15 | v141 |
| 14 | v140 |
| 13 | v120 |
| 12 | v120 |
| 11 | v110 |
| 10 | v100 |
| 9 | v90 |
| 8 | v80 |

### self.info.discard_build_settings() / self.info.include_build_settings()

By default (`discard_build_settings()`) Conan will generate the same binary when you change the `os_build` or `arch_build` when the `os` and `arch` are declared respectively. This is because `os_build` represent the machine running Conan, so, for the consumer, the only setting that matters is where the built software will run, not where is running the compilation. The same applies to `arch_build`.

With `self.info.include_build_settings()`, Conan will generate different packages when you change the `os_build` or `arch_build`.

```
def package_id(self):
    self.info.discard_build_settings()
    # self.info.include_build_settings()
```

### self.info.default_std_matching() / self.info.default_std_non_matching()

By default (`default_std_matching()`) Conan will detect the default C++ standard of your compiler to not generate different binary packages.

For example, you already built some `gcc > 6.1` packages, where the default std is `gnu14`. If you introduce the `cppstd` setting in your recipes and specify the `gnu14` value, Conan won't generate new packages, because it was already the default of your compiler.

With `self.info.default_std_non_matching()`, Conan will generate different packages when you specify the `cppstd` even if it matches with the default of the compiler being used:

```
def package_id(self):
    self.info.default_std_non_matching()
    # self.info.default_std_matching()
```

### build_id()

In the general case, there is one build folder for each binary package, with the exact same hash/ID of the package. However this behavior can be changed, there are a couple of scenarios that this might be interesting:

- You have a build script that generates several different configurations at once, like both debug and release artifacts, but you actually want to package and consume them separately. Same for different architectures or any other setting.
- You build just one configuration (like release), but you want to create different binary packages for different consuming cases. For example, if you have created tests for the library in the build step, you might want to create two packages: one just containing the library for general usage, and another one also containing the tests. First package could be used as a reference and the other one as a tool to debug errors.

In both cases, if using different settings, the system will build twice (or more times) the same binaries, just to produce a different final binary package. With the `build_id()` method this logic can be changed. `build_id()` will create a new package ID/hash for the build folder, and you can define the logic you want in it. For example:

```
settings = "os", "compiler", "arch", "build_type"

def build_id(self):
    self.info_build.settings.build_type = "Any"
```

So this recipe will generate a final different package for each debug/release configuration. But as the `build_id()` will generate the same ID for any `build_type`, then just one folder and one build will be done. Such build should

build both debug and release artifacts, and then the `package()` method should package them accordingly to the `self.settings.build_type` value. Different builds will still be executed if using different compilers or architectures. This method is basically an optimization of build time, avoiding multiple re-builds.

Other information like custom package options can also be changed:

```
def build_id(self):
    self.info_build.options.myoption = 'MyValue' # any value possible
    self.info_build.options.fullsource = 'Always'
```

If the `build_id()` method does not modify the `build_id`, and produce a different one than the `package_id`, then the standard behavior will be applied. Consider the following:

```
settings = "os", "compiler", "arch", "build_type"

def build_id(self):
    if self.settings.os == "Windows":
        self.info_build.settings.build_type = "Any"
```

This will only produce a build ID different if the package is for Windows. So the behavior in any other OS will be the standard one, as if the `build_id()` method was not defined: the build folder will be wiped at each **`conan create`** command and a clean build will be done.

#### deploy()

This method can be used in a *conanfile.py* to install in the system or user folder artifacts from packages.

```
def deploy(self):
    self.copy("*.exe")  # copy from current package
    self.copy_deps("*.dll") # copy from dependencies
```

Where:

- `self.copy()` is the `self.copy()` method executed inside *package() method*.
- `self.copy_deps()` is the same as `self.copy()` method inside *imports() method*.

Both methods allow the definition of absolute paths (to install in the system), in the `dst` argument. By default, the `dst` destination folder will be the current one.

The `deploy()` method is designed to work on a package that is installed directly from its reference, as:

```
$ conan install Pkg/0.1@user/channel
> ...
> Pkg/0.1@user/testing deploy(): Copied 1 '.dll' files: mylib.dll
> Pkg/0.1@user/testing deploy(): Copied 1 '.exe' files: myexe.exe
```

All other packages and dependencies, even transitive dependencies of "Pkg/0.1@user/testing" will not be deployed, it is the responsibility of the installed package to deploy what it needs from its dependencies.

### 14.3.3 Python requires

It is possible to reuse python code existing in other *conanfile.py* recipes with the `python_requires()` functionality, doing something like:

```
from conans import python_requires

base = python_requires("MyBuild/0.1@user/channel")

class PkgTest(base.MyBase):
    ...
    def build(self):
        base.my_build(self.settings)
```

See this section: *Python requires: reusing python code in recipes*

### 14.3.4 Output and Running

#### Output contents

Use the *self.output* to print contents to the output.

```
self.output.success("This is a good, should be green")
self.output.info("This is a neutral, should be white")
self.output.warn("This is a warning, should be yellow")
self.output.error("Error, should be red")
self.output.rewrite_line("for progress bars, issues a cr")
```

Check the source code. You might be able to produce different outputs with different colors.

#### Running commands

```
run(self, command, output=True, cwd=None, win_bash=False, subsystem=None, msys_
↪mingw=True,
    ignore_errors=False, run_environment=False):
```

`self.run()` is a helper to run system commands and throw exceptions when errors occur, so that command errors are do not pass unnoticed. It is just a wrapper for `os.system()`

When the environment variable `CONAN_PRINT_RUN_COMMANDS` is set to true (or its equivalent `print_run_commands` *conan.conf* configuration variable, under `[general]`) then all the invocations of `self.run()` will print to output the command to be executed.

Optional parameters:

- **output (Optional, Defaulted to `True`) When True it will write in stdout.** You can pass any stream that accepts a `write` method like a `six.StringIO()`:

```
from six import StringIO  # Python 2 and 3 compatible
mybuf = StringIO()
self.run("mycommand", output=mybuf)
self.output.warn(mybuf.getvalue())
```

- **cwd** (Optional, Defaulted to `.` current directory): Current directory to run the command.
- **win_bash** (Optional, Defaulted to `False`): When True, it will run the configure/make commands inside a bash.
- **subsystem** (Optional, Defaulted to `None` will autodetect the subsystem). Used to escape the command according to the specified subsystem.
- **msys_mingw** (Optional, Defaulted to `True`) If the specified subsystem is MSYS2, will start it in MinGW mode (native windows development).

- **ignore_errors** (Optional, Defaulted to `False`). This method raises an exception if the command fails. If `ignore_errors=True`, it will not raise an exception. Instead, the user can use the return code to check for errors.
- **run_environment** (Optional, Defaulted to `False`). Applies a `RunEnvironment`, so the environment variables PATH, LD_LIBRARY_PATH and DYLIB_LIBRARY_PATH are defined in the command execution adding the values of the "lib" and "bin" folders of the dependencies. Allows executables to be easily run using shared libraries from its dependencies.

## 14.4 Generators

Generators are specific components that provide the information of dependencies calculated by Conan in a suitable format for a build system. They normally provide Conan users with a *conanbuildinfo.XXX* file that can be included or injected to the specific build system. The file generated contains information of dependencies in form of different variables and sometimes function helpers too.

You can specify a generator in:

- The `[generators]` section from *conanfile.txt*
- The `generators` attribute in *conanfile.py*

Available generators:

### 14.4.1 *cmake*

This is the reference page for `cmake` generator. Go to *Integrations/CMake* if you want to learn how to integrate your project or recipes with CMake.

It generates a file named `conanbuildinfo.cmake` and declares some variables and methods

#### Variables in conanbuildinfo.cmake

- **Package declared vars**

For each requirement `conanbuildinfo.cmake` file declares the following variables. `XXX` is the name of the require in uppercase. e.k "ZLIB" for `zlib/1.2.8@lasote/stable` requirement:

| NAME | VALUE |
|---|---|
| CONAN_XXX_ROOT | Abs path to root package folder. |
| CONAN_INCLUDE_DIRS_XXX | Header's folders |
| CONAN_LIB_DIRS_XXX | Library folders (default {CONAN_XXX_ROOT}/lib) |
| CONAN_BIN_DIRS_XXX | Binary folders (default {CONAN_XXX_ROOT}/bin) |
| CONAN_LIBS_XXX | Library names to link |
| CONAN_DEFINES_XXX | Library defines |
| CONAN_COMPILE_DEFINITIONS_XXX | Compile definitions |
| CONAN_CXX_FLAGS_XXX | CXX flags |
| CONAN_SHARED_LINK_FLAGS_XXX | Shared link flags |
| CONAN_C_FLAGS_XXX | C flags |

- **Global declared vars**

Conan also declares some global variables with the aggregated values of all our requirements. The values are ordered in the right order according to the dependency tree.

| NAME | VALUE |
|---|---|
| CONAN_INCLUDE_DIRS | Aggregated header's folders |
| CONAN_LIB_DIRS | Aggregated library folders |
| CONAN_BIN_DIRS | Aggregated binary folders |
| CONAN_LIBS | Aggregated library names to link |
| CONAN_DEFINES | Aggregated library defines |
| CONAN_COMPILE_DEFINITIONS | Aggregated compile definitions |
| CONAN_CXX_FLAGS | Aggregated CXX flags |
| CONAN_SHARED_LINK_FLAGS | Aggregated Shared link flags |
| CONAN_C_FLAGS | Aggregated C flags |

- **Variables from user_info**

If any of the requirements is filling the *user_info* object in the *package_info* method a set of variables will be declared following this naming:

| NAME | VALUE |
|---|---|
| CONAN_USER_XXXX_YYYY | User declared value |

`XXXX` is the name of the requirement in uppercase and `YYYY` the variable name, e.g.:

```
class MyLibConan(ConanFile):
    name = "MyLib"
    version = "1.6.0"

    # ...

    def package_info(self):
        self.user_info.var1 = 2
```

When other library requires `MyLib` and uses the cmake generator:

**conanbuildinfo.cmake**:

```
# ...
set(CONAN_USER_MYLIB_var1 "2")
```

### Methods available in conanbuildinfo.cmake

#### conan_basic_setup

Setup all the CMake vars according to our settings, by default with the global approach (no targets).

**parameters**: You can combine several parameters to the `conan_basic_setup` macro, e.g., `conan_basic_setup(TARGETS KEEP_RPATHS)`

- `TARGETS`: Setup all the CMake vars by target (only CMake > 3.1.2)
- `NO_OUTPUT_DIRS`: Do not adjust the output directories
- `KEEP_RPATHS`: Do not adjust the CMAKE_SKIP_RPATH variable in OSX

#### conan_target_link_libraries

Helper to link all libraries to a specified target.

#### Other optional methods

There are other methods automatically called by `conan_basic_setup()` but you can use them directly:

| NAME | DESCRIPTION |
|---|---|
| conan_check_compiler() | Checks that your compiler matches the one declared in settings<br>Can be disabled setting `CONAN_DISABLE_CHECK_COMPILER` CMake var |
| conan_output_dirs_setup() | Adjust the bin/ and lib/ output directories |
| conan_set_find_library_paths() | Set CMAKE_INCLUDE_PATH and CMAKE_INCLUDE_PATH |
| conan_global_flags() | Set include_directories, link_directories, link_directories, flags |
| conan_define_targets() | Define the targets (target flags instead of global flags) |
| conan_set_rpath() | Set CMAKE_SKIP_RPATH=1 if APPLE |
| conan_set_vs_runtime() | Adjust the runtime flags (/MD /MDd /MT /MTd) |
| conan_set_libcxx(TARGETS) | Adjust the standard library flags (libstdc++, libc++, libstdc++11) |
| conan_set_find_paths() | Adjust CMAKE_MODULE_PATH and CMAKE_PREFIX_PATH |

#### Targets generated by conanbuildinfo.cmake

If you use `conan_basic_setup(TARGETS)`, then some cmake targets will be generated (this only works for CMake > 3.1.2)

These targets are:

- A `CONAN_PKG::PkgName` target per package in the dependency graph. This is an `IMPORTED INTERFACE` target. IMPORTED because it is external, a pre-compiled library. INTERFACE, because it doesn't necessarily match a library, it could be a header-only library, or the package could even contain several libraries. It contains all the properties (include paths, compile flags, etc) that are defined in the `package_info()` method of the package.
- Inside each package a `CONAN_LIB::PkgName_LibName` target will be generated for each library. Its type is `IMPORTED UNKNOWN`, its main purpose is to provide a correct link order. Their only properties are the location and the dependencies
- A `CONAN_PKG` depends on every `CONAN_LIB` that belongs to it, and to its direct public dependencies (i.e. other `CONAN_PKG` targets from its `requires`)
- Each `CONAN_LIB` depends on the direct public dependencies `CONAN_PKG` targets of its container package. This guarantees correct link order.

### 14.4.2 *cmake_multi*

This is the reference page for `cmake_multi` generator. Go to *Integrations/CMake* if you want to learn how to integrate your project or recipes with CMake.

#### Usage

```
$ conan install -g cmake_multi -s build_type=Release ...
$ conan install -g cmake_multi -s build_type=Debug ...
```

These commands will generate 3 files:

- `conanbuildinfo_release.cmake`: Variables adjusted only for build_type Release
- `conanbuildinfo_debug.cmake`: Variables adjusted only for build_type Debug
- `conanbuildinfo_multi.cmake`: Which includes the other two, and enables its use

#### Variables in conanbuildinfo_release.cmake

Same as *conanbuildinfo.cmake* with suffix `_RELEASE`

#### Variables in conanbuildinfo_debug.cmake

Same as *conanbuildinfo.cmake* with suffix `_DEBUG`

#### Available Methods

Same as *conanbuildinfo.cmake*

### 14.4.3 *cmake_paths*

This is the reference page for `cmake_paths` generator. Go to *Integrations/CMake* if you want to learn how to integrate your project or recipes with CMake.

It generates a file named `conan_paths.cmake` and declares two variables:

#### Variables in *conan_paths.cmake*

| NAME | VALUE |
|---|---|
| CMAKE_MODULE_PATH | Containing all requires root folders, any declared *self.cpp_info.builddirs* and the current directory of this file |
| CMAKE_PREFIX_PATH | Containing all requires root folders, any declared *self.cpp_info.builddirs* and the current directory of this file |

### 14.4.4 *cmake_find_package*

This is the reference page for `cmake_find_package` generator. Go to *Integrations/CMake* if you want to learn how to integrate your project or recipes with CMake.

The `cmake_find_package` generator creates a file for each requirement specified in the conanfile.

The name of the files follow the pattern `Find<package_name>.cmake`. So for the `zlib/1.2.11@conan/stable` package, a `Findzlib.cmake` file will be generated.

#### Variables in Find{name}.cmake

Being {name} the package name:

| NAME | VALUE |
|---|---|
| {name}_FOUND | Set to 1 |
| {name}_INCLUDE_DIRS | Containing all the include directories of the package |
| {name}_INCLUDES | Same as the XXX_INCLUDE_DIRS |
| {name}_DEFINITIONS | Definitions of the library |
| {name}_LIBRARIES | Library paths to link |
| {name}_LIBS | Same as XXX_LIBRARIES |

#### Target in Find<package_name>.cmake

A target named `{name}::{name}` target is generated with the following properties adjusted:

- `INTERFACE_INCLUDE_DIRECTORIES`: Containing all the include directories of the package.
- `INTERFACE_LINK_LIBRARIES`: Library paths to link.
- `INTERFACE_COMPILE_DEFINITIONS`: Definitions of the library.

The targets are transitive. So, if your project depends on a packages `A` and `B`, and at the same time `A` depends on `C`, the `A` target will contain automatically the properties of the `C` dependency, so in your *CMakeLists.txt* file you only need to `find_package(A)` and `find_package(B)`.

### 14.4.5 visual_studio

This is the reference page for `visual_studio` generator. Go to *Integrations/Visual Studio* if you want to learn how to integrate your project or recipes with Visual Studio.

Generates a file named `conanbuildinfo.props` containing an XML that can be imported to your *Visual Studio* project.

Generated xml structure:

```
<?xml version="1.0" encoding="utf-8"?>
<Project ToolsVersion="4.0" xmlns="http://schemas.microsoft.com/developer/msbuild/2003
↪">
  <ImportGroup Label="PropertySheets" />
  <PropertyGroup Label="UserMacros" />
  <PropertyGroup Label="Conan-RootDirs">
    <Conan-Lib1-Root>{PACKAGE LIB1 FOLDER}</Conan-Poco-Root>
    <Conan-Lib2-Root>{PACKAGE LIB2 FOLDER}</Conan-Poco-Root>
    ...
  </PropertyGroup>
  <PropertyGroup Label="ConanVariables">
    <ConanBinaryDirectories>{CONAN BINARY DIRECTORIES LIST}</ConanBinaryDirectories>
    <ConanResourceDirectories>{CONAN RESOURCE DIRECTORIES LIST}</
↪ConanResourceDirectories>
  </PropertyGroup>
  <PropertyGroup>
    <LocalDebuggerEnvironment>PATH=%PATH%;{CONAN BINARY DIRECTORIES LIST}</
↪LocalDebuggerEnvironment>
    <DebuggerFlavor>WindowsLocalDebugger</DebuggerFlavor>
  </PropertyGroup>
```

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```
  <ItemDefinitionGroup>
    <ClCompile>
      <AdditionalIncludeDirectories>{CONAN INCLUDE DIRECTORIES LIST}
↪%(AdditionalIncludeDirectories)</AdditionalIncludeDirectories>
      <PreprocessorDefinitions>{CONAN DEFINITIONS}%(PreprocessorDefinitions)</
↪PreprocessorDefinitions>
      <AdditionalOptions> %(AdditionalOptions)</AdditionalOptions>
    </ClCompile>
    <Link>
      <AdditionalLibraryDirectories>{CONAN LIB DIRECTORIES LIST}
↪%(AdditionalLibraryDirectories)</AdditionalLibraryDirectories>
      <AdditionalDependencies>{CONAN LIBS LIST}</AdditionalDependencies>
      <AdditionalOptions> %(AdditionalOptions)</AdditionalOptions>
    </Link>
  </ItemDefinitionGroup>
  <ItemGroup />
</Project>
```

Note that for single-configuration packages, which is the most typical, conan install Debug/Release, 32/64bits, packages separately. So a different property sheet will be generated for each configuration. The process could be:

Given for example a `conanfile.txt` like:

```
[requires]
Pkg/0.1@user/channel

[generators]
visual_studio
```

And assuming that binary packages exist for `Pkg/0.1@user/channel`, we could do:

```
$ mkdir debug32 && cd debug32
$ conan install .. -s compiler="Visual Studio" -s compiler.version=15 -s arch=x86 -s␣
↪build_type=Debug
$ cd ..
$ mkdir debug64 && cd debug64
$ conan install .. -s compiler="Visual Studio" -s compiler.version=15 -s arch=x86_64 -
↪s build_type=Debug
$ cd ..
$ mkdir release32 && cd release32
$ conan install .. -s compiler="Visual Studio" -s compiler.version=15 -s arch=x86 -s␣
↪build_type=Release
$ cd ..
$ mkdir release64 && cd release64
$ conan install .. -s compiler="Visual Studio" -s compiler.version=15 -s arch=x86_64 -
↪s build_type=Release
...
# Now go to VS 2017 Property Manager, load the respective sheet into each␣
↪configuration
```

The above process can be simplified using profiles (assuming you have created the respective profiles), and you can also specify the generators in the command line:

```
$ conan install .. -pr=vs15release64 -g visual_studio
...
```

### 14.4.6 *visual_studio_multi*

This is the reference page for `visual_studio_multi` generator. Go to *Integrations/Visual Studio* if you want to learn how to integrate your project or recipes with Visual Studio.

#### Usage

```
$ conan install . -g visual_studio_multi -s arch=x86 -s build_type=Debug
$ conan install . -g visual_studio_multi -s arch=x86_64 -s build_type=Debug
$ conan install . -g visual_studio_multi -s arch=x86 -s build_type=Release
$ conan install . -g visual_studio_multi -s arch=x86_64 -s build_type=Release
```

These commands will generate 5 files for each compiler version:

- `conanbuildinfo_multi.props`: All properties
- `conanbuildinfo_release_x64_v141.props.props`: Variables for release/64bits/VS2015 (toolset v141)
- `conanbuildinfo_debug_x64_v141.props.props`: Variables for debug/64bits/VS2015 (toolset v141)
- `conanbuildinfo_release_win32_v141.props.props`: Variables for release/32bits/VS2015 (toolset v141)
- `conanbuildinfo_debug_win32_v141.props.props`: Variables for debug/32bits/VS2015 (toolset v141)

You can now load `conanbuildinfo_multi.props` in your Visual Studio IDE property manager, and all configurations will be loaded at once.

Each one of the configurations will have the format and information defined in *the visual_studio generator*

### 14.4.7 visual_studio_legacy

Generates a file named `conanbuildinfo.vsprops` containing an XML that can be imported to your *Visual Studio 2008* project. Note that the format of this file is different and incompatible with the `conanbuildinfo.props` file generated with the `visual_studio` generator for newer VS.

Generated xml structure:

```
<?xml version="1.0" encoding="Windows-1252"?>
<VisualStudioPropertySheet
    ProjectType="Visual C++"
    Version="8.00"
    Name="conanbuildinfo"
    >
    <Tool
        Name="VCCLCompilerTool"
        AdditionalOptions="{compiler_flags}"
        AdditionalIncludeDirectories="{include_dirs}"
        PreprocessorDefinitions="{definitions}"
    />
    <Tool
        Name="VCLinkerTool"
        AdditionalOptions="{linker_flags}"
        AdditionalDependencies="{libs}"
```

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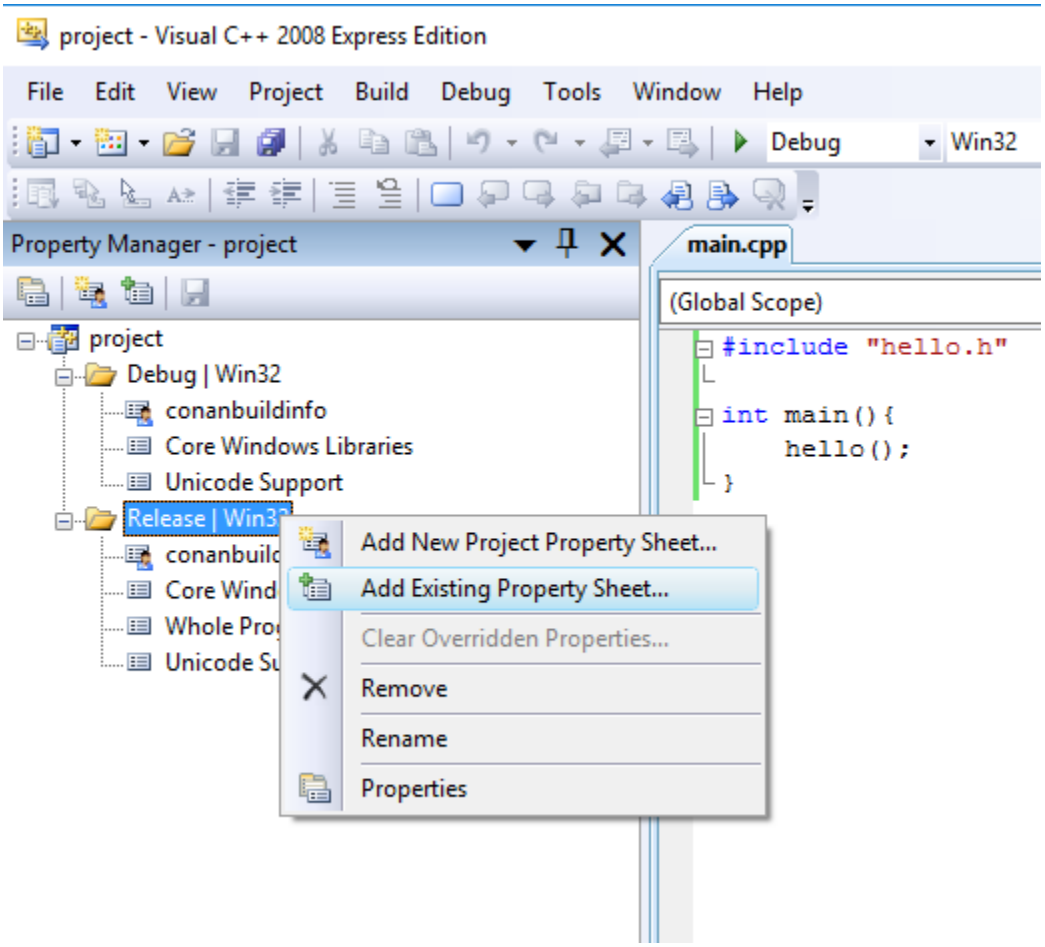
```
        AdditionalLibraryDirectories="{lib_dirs}"
    />
</VisualStudioPropertySheet>
```

This file can be loaded from the Menu->View->PropertyManager window, selecting "Add Existing Property Sheet" for the desired configuration.




Note that for single-configuration packages, which is the most typical, conan install Debug and Release packages separately. So a different property sheet will be generated for each configuration. The process could be:

Given for example a conanfile.txt like:

```
[requires]
Pkg/0.1@user/channel

[generators]
visual_studio_legacy
```

And assuming that binary packages exist for `Pkg/0.1@user/channel`, we could do:

```
$ mkdir debug && cd debug
$ conan install .. -s compiler="Visual Studio" -s compiler.version=9 -s arch=x86 -s␣
↪build_type=Debug
$ cd ..
```

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```
$ mkdir release && cd release
$ conan install .. -s compiler="Visual Studio" -s compiler.version=9 -s arch=x86 -s␣
↪build_type=Release
# Now go to VS 2008 Property Manager, load the respective sheet into each␣
↪configuration
```

The above process can be simplified using profiles (assuming you have created "vs9release" profile), and you can also specify the generators in the command line:

```
$ conan install .. -pr=vs9release -g visual_studio_legacy
```

### 14.4.8 xcode

This is the reference page for `xcode` generator. Go to *Integrations/Xcode* if you want to learn how to integrate your project or recipes with Xcode.

The **xcode** generator creates a file named `conanbuildinfo.xcconfig` that can be imported to your *Xcode* project.

The file declare these variables:

| VARIABLE | VALUE |
|---|---|
| HEADER_SEARCH_PATHS | The requirements *include dirs* |
| LIBRARY_SEARCH_PATHS | The requirements *lib dirs* |
| OTHER_LDFLAGS | *-lXXX* corresponding to library names |
| GCC_PREPROCESSOR_DEFINITIONS | The requirements definitions |
| OTHER_CFLAGS | The requirements cflags |
| OTHER_CPLUSPLUSFLAGS | The requirements cxxflags |
| FRAMEWORK_SEARCH_PATHS | The requirements root folders, so xcode can find packaged frameworks |

### 14.4.9 compiler_args

This is the reference page for `compiler_args` generator. Go to *Integrations/Compilers on command line* if you want to learn how to integrate your project calling your compiler in the command line.

Generates a file named `conanbuildinfo.args` containing a command line parameters to invoke `gcc`, `clang` or `cl` compiler.

You can use the **compiler_args** generator directly to build simple programs:

**gcc/clang**:

```
> g++ timer.cpp @conanbuildinfo.args -o bin/timer
```

**cl**:

```
$ cl /EHsc timer.cpp @conanbuildinfo.args
```

**gcc/clang**

| FLAG | MEANING |
|---|---|
| -DXXX | Corresponding to requirements *defines* |
| -IXXX | Corresponding to requirements *include dirs* |
| -Wl,-rpathXXX | Corresponding to requirements *lib dirs* |
| -LXXX | Corresponding to requirements *lib dirs* |
| -lXXX | Corresponding to requirements *libs* |
| -m64 | For x86_64 architecture |
| -m32 | For x86 architecture |
| -DNDEBUG | For Release builds |
| -s | For Release builds (only gcc) |
| -g | For Debug builds |
| -D_GLIBCXX_USE_CXX11_ABI=0 | When setting libcxx == "libstdc++" |
| -D_GLIBCXX_USE_CXX11_ABI=1 | When setting libcxx == "libstdc++11" |
| Other flags | cppflags, cflags, sharedlinkflags, exelinkflags (applied directly) |

**cl (Visual Studio)**

| FLAG | MEANING |
|---|---|
| /DXXX | Corresponding to requirements *defines* |
| /IXXX | Corresponding to requirements *include dirs* |
| /LIBPATH:XX | Corresponding to requirements *lib dirs* |
| /MT, /MTd, /MD, /MDd | Corresponding to Runtime |
| -DNDEBUG | For Release builds |
| /Zi | For Debug builds |

You can also use it in a recipe:

```
from conans import ConanFile

class PocoTimerConan(ConanFile):
   settings = "os", "compiler", "build_type", "arch"
   requires = "Poco/1.9.0@pocoproject/stable"
   generators = "compiler_args"
   default_options = {"Poco:shared": True, "OpenSSL:shared": True}

   def imports(self):
      self.copy("*.dll", dst="bin", src="bin") # From bin to bin
      self.copy("*.dylib*", dst="bin", src="lib") # From lib to bin

   def build(self):
      self.run("mkdir -p bin")
      command = 'g++ timer.cpp @conanbuildinfo.args -o bin/timer'
      self.run(command)
```

### 14.4.10 gcc

Deprecated, use *compiler_args* generator instead.

### 14.4.11 Boost Build

**Caution:** This generator is deprecated in favor of the `b2` generator. See *generator b2*.

The **boost-build** generator creates a file named `project-root.jam` that can be used with your *Boost Build* build system script.

The generated `project-root.jam` will generate several sections, and an alias `conan-deps` with the sections name:

```
lib ssl :
    : # requirements
    <name>ssl
    <search>/path/to/package/227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/lib
    : # default-build
    : # usage-requirements
    <include>/path/to/package/227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/include
    ;

lib crypto :
    : # requirements
    <name>crypto
    <search>/path/to/package/227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/lib
    : # default-build
    : # usage-requirements
    <include>/path/to/package/227fb0ea22f4797212e72ba94ea89c7b3fbc2a0c/include
    ;

lib z :
    : # requirements
    <name>z
    <search>/path/to/package/8018a4df6e7d2b4630a814fa40c81b85b9182d2b/lib
    : # default-build
    : # usage-requirements
    <include>/path/to/package/8018a4df6e7d2b4630a814fa40c81b85b9182d2b/include
    ;

alias conan-deps :
    ssl
    crypto
    z
;
```

### 14.4.12 *B2* [EXPERIMENTAL]

This is the reference page for the `B2`, aka *Boost Build*, generator. It is a multi-generator to match the multi-build nature of `B2`.

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

### Usage

```
# Use release dependencies:
$ conan install -g b2 -s build_type=Release ...
# Optionally, also use debug dependencies:
$ conan install -g b2 -s build_type=Debug ...
# And so on for any number of configurations you need.
```

The commands will generate 3 files:

- `conanbuildinfo.jam`: Which includes the other two, and enables its use.
- `conanbuildinfo-XXX.jam`: Variables and targets adjusted only for build_type Release, where `XXX` is a key indicating the full variation built.
- `conanbuildinfo-YYY.jam`: Variables and targets adjusted only for build_type Debug, where `YYY` is a key indicating the full variation built.

### Sub-projects in conanbuildinfo-XXX.jam

The `B2` generator defines sub-projects relative to the location of the `B2` project you generate the conan configuration. For each package a sub-project with the package name is created that contains targets you can use as `B2` sources in your projects.

For example with this `conanfile.txt`:

```
[requires]
clara/[>=1.1.0]@bincrafters/stable
boost_predef/[>=1.66.0]@bincrafters/stable
zlib/[>=1.2.11]@conan/stable

[generators]
b2
```

You would get three sub-projects defined relative to the `conanfile.txt` location:

```
project clara ;
project boost_predef ;
project zlib ;
```

For a root level project those could be referenced with an absolute project path, for example `/clara`. Or you can use relative project paths as needed, for example `../clara` or `subproject/clara`.

### Targets in conanbuildinfo-XXX.jam

For each package a target in the corresponding package subproject is created that is specific to the variant built. There is also a general `libs` target that is an alias to all the package library targets. For header only packages this `libs` target would not contain references to the package libraries as they do not exist. But it would still contain the rest of the Usage requirements for you to make use of the headers in that package. For example, for the above `conanfile.txt` the targets would be..

`clara subproject`:

```
alias libs
    : # source, none as it's header only
    : # requirements specific to the build
```

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```
      ...
    : # default-build
    : # usage-requirements
      <include>/absolute/path/to/conan/package/include
      <define>...
      <cflags>...
      <cxxflags>...
      <link>shared:<linkflags>...
    ;
```

Where `...` contains references to the variant specific constants. The target for `boost_predef` is equivalent as that's also a header only library. For `libz` it contains a built linkable library and hence it has additional targets for that.

`libz subproject`:

```
alias z
    : # source, no source as it's a searched pre-built library
    : # requirements
      <name>z
      <search>/absolute/path/to/conan/package/lib
      # rest of the requirements specific to the build
    : # default-build
    : # usage-requirements
      <include>/abolute/path/to/conan/package/include
      <define>...
      <cflags>...
      <cxxflags>...
      <link>shared:<linkflags>...
    ;

alias libs
    : # source
      z
    : # requirements specific to the build
      ...
    : # default-build
    : # usage-requirements
      <include>/absolute/path/to/conan/package/include
      <define>...
      <cflags>...
      <cxxflags>...
      <link>shared:<linkflags>...
    ;
```

### Constants in conanbuildinfo-XXX.jam

This generator also defines constants, and path constants, in the project where the conanfile.txt is located. The constants define variant specific variables for all the packages and a transitive `conan` set of constants for all the packages.

- **Per package constants**

For each requirement `conanbuildinfo-XXX.cmake` file declares the following constants. `variation` is the name of the package and variation. That `YYY` variation takes the form of a comma separated list of: package name, address-model, architecture, target-os, toolset with version, and variant (`debug`, `release`, `relwithdebinfo`, and `minsizerel`). All are lower case and use the values of the corresponding `B2` features. For example a

`boost_predef` package dependency when building with apple-clang 9.0 and debug would be: `boost_predef,64,x86,darwin,clang-9.0,debug`.

| NAME | VALUE |
|---|---|
| rootpath(variation) | Abs path to root package folder. |
| includedirs(variation) | Header's folders |
| libdirs(variation) | Library folders (default {rootpath}/lib) |
| defines(variation) | Library defines |
| cppflags(variation) | CXX flags |
| sharedlinkflags(variation) | Shared link flags |
| cflags(variation) | C flags |
| requirements(variation) | B2 requirements |
| usage-requirements(variation) | B2 usage requirements |

Both the `requirements` and `usage-requirements` are synthesized from the other constants.

- **Global declared constants**

The generator also defines a corresponding set of constants that aggregate the values of all the package requirements. The constants for this are the same as the package-specific ones but with "conan" as the name of the project.

- **Constants from user_info**

If any of the requirements is filling the user_info object in the package_info method a set of constants will be declared following this naming:

| NAME | VALUE |
|---|---|
| user(name,variation) | User declared value |

`variation` is the package and variant as above and `name` the variable name in lower case. For example:

```
class MyLibConan(ConanFile):
    name = "MyLib"
    version = "1.6.0"

    # ...

    def package_info(self):
        self.user_info.var1 = 2
```

When other library requires `MyLib` and uses the `B2` generator:

**conanbuildinfo-XXX.jam**:

```
constant user(var1,mylib,...) : "2" ;
```

### 14.4.13 qbs

This is the reference page for `qbs` generator. Go to *Integrations/Qbs* if you want to learn how to integrate your project or recipes with Qbs.

Generates a file named `conanbuildinfo.qbs` that can be used for your qbs builds.

A Product `ConanBasicSetup` contains the aggregated requirement values and also there is N Product declared, one per requirement.

```
import qbs 1.0

Project {
    Product {
        name: "ConanBasicSetup"
        Export {
            Depends { name: "cpp" }
            cpp.includePaths: [{INCLUDE DIRECTORIES REQUIRE 1}, {INCLUDE DIRECTORIES␣
↪REQUIRE 2}]
            cpp.libraryPaths: [{LIB DIRECTORIES REQUIRE 1}, {LIB DIRECTORIES REQUIRE␣
↪2}]
            cpp.systemIncludePaths: [{BIN DIRECTORIES REQUIRE 1}, {BIN DIRECTORIES␣
↪REQUIRE 2}]
            cpp.dynamicLibraries: [{LIB NAMES REQUIRE 1}, {LIB NAMES REQUIRE 2}]
            cpp.defines: []
            cpp.cppFlags: []
            cpp.cFlags: []
            cpp.linkerFlags: []
        }
    }

    Product {
        name: "REQUIRE1"
        Export {
            Depends { name: "cpp" }
            cpp.includePaths: [{INCLUDE DIRECTORIES REQUIRE 1}]
            cpp.libraryPaths: [{LIB DIRECTORIES REQUIRE 1}]
            cpp.systemIncludePaths: [{BIN DIRECTORIES REQUIRE 1}]
            cpp.dynamicLibraries: ["{LIB NAMES REQUIRE 1}"]
            cpp.defines: []
            cpp.cppFlags: []
            cpp.cFlags: []
            cpp.linkerFlags: []
        }
    }
    // lib root path: {ROOT PATH REQUIRE 1}

    Product {
        name: "REQUIRE2"
        Export {
            Depends { name: "cpp" }
            cpp.includePaths: [{INCLUDE DIRECTORIES REQUIRE 2}]
            cpp.libraryPaths: [{LIB DIRECTORIES REQUIRE 2}]
            cpp.systemIncludePaths: [{BIN DIRECTORIES REQUIRE 2}]
            cpp.dynamicLibraries: ["{LIB NAMES REQUIRE 2}"]
            cpp.defines: []
            cpp.cppFlags: []
            cpp.cFlags: []
            cpp.linkerFlags: []
        }
    }
    // lib root path: {ROOT PATH REQUIRE 2}
}
```

### 14.4.14 qmake

This is the reference page for `qmake` generator. Go to *Integrations/Qmake* if you want to learn how to integrate your project or recipes with qmake.

Generates a file named `conanbuildinfo.pri` that can be used for your qbs builds. The file contains:

- N groups of variables, one group per require, declaring the same individual values: include_paths, libs, bin dirs, libraries, defines etc.
- One group of global variables with the aggregated values for all requirements.

**Package declared vars**

For each requirement `conanbuildinfo.pri` file declares the following variables. `XXX` is the name of the require in uppercase. e.k "ZLIB" for `zlib/1.2.8@lasote/stable` requirement:

| NAME | VALUE |
|---|---|
| CONAN_XXX_ROOT | Abs path to root package folder. |
| CONAN_INCLUDEPATH_XXX | Header's folders |
| CONAN_LIB_DIRS_XXX | Library folders (default {CONAN_XXX_ROOT}/lib) |
| CONAN_BINDIRS_XXX | Binary folders (default {CONAN_XXX_ROOT}/bin) |
| CONAN_LIBS_XXX | Library names to link |
| CONAN_DEFINES_XXX | Library defines |
| CONAN_COMPILE_DEFINITIONS_XXX | Compile definitions |
| CONAN_QMAKE_CXXFLAGS_XXX | CXX flags |
| CONAN_QMAKE_LFLAGS_XXX | Shared link flags |
| CONAN_QMAKE_CFLAGS_XXX | C flags |

**Global declared vars**

Conan also declares some global variables with the aggregated values of all our requirements. The values are ordered in the right order according to the dependency tree.

| NAME | VALUE |
|---|---|
| CONAN_INCLUDEPATH | Aggregated header's folders |
| CONAN_LIB_DIRS | Aggregated library folders |
| CONAN_BINDIRS | Aggregated binary folders |
| CONAN_LIBS | Aggregated library names to link |
| CONAN_DEFINES | Aggregated library defines |
| CONAN_COMPILE_DEFINITIONS | Aggregated compile definitions |
| CONAN_QMAKE_CXXFLAGS | Aggregated CXX flags |
| CONAN_QMAKE_LFLAGS | Aggregated Shared link flags |
| CONAN_QMAKE_CFLAGS | Aggregated C flags |

#### Methods available in conanbuildinfo.pri

| NAME | DESCRIPTION |
|---|---|
| conan_basic_setup() | Setup all the qmake vars according to our settings with the global approach |

### 14.4.15 scons

Conan provides *integration with SCons* with this generator.

The generated `SConscript_conan` will generate several dictionaries, like:

```
"conan" : {
    "CPPPATH"     : ['/path/to/include'],
    "LIBPATH"     : ['/path/to/lib'],
    "BINPATH"     : ['/path/to/bin'],
    "LIBS"        : ['hello'],
    "CPPDEFINES"  : [],
    "CXXFLAGS"    : [],
    "CCFLAGS"     : [],
    "SHLINKFLAGS" : [],
    "LINKFLAGS"   : [],
},

"Hello" : {
    "CPPPATH"     : ['/path/to/include'],
    "LIBPATH"     : ['/path/to/lib'],
    "BINPATH"     : ['/path/to/bin'],
    "LIBS"        : ['hello'],
    "CPPDEFINES"  : [],
    "CXXFLAGS"    : [],
    "CCFLAGS"     : [],
    "SHLINKFLAGS" : [],
    "LINKFLAGS"   : [],
},
```

The `conan` dictionary will contain the aggregated values for all dependencies, while the individual `"Hello"` dictionaries, one per package, will contain just the values for that specific dependency.

These dictionaries can be directly loaded into the environment like:

```
conan = SConscript('{}/SConscript_conan'.format(build_path_relative_to_sconstruct))
env.MergeFlags(conan['conan'])
```

### 14.4.16 pkg_config

Generates N files named `{dep_name}.pc`, containing a valid pkg-config file syntax. The `prefix` variable is automatically adjusted to the `package_folder`.

Go to *Integrations/pkg-config and pc files/Use the pkg_config generator* if you want to learn how to use this generator.

### 14.4.17 virtualenv

This is the reference page for `virtualenv` generator. Go to *Mastering/Virtual Environments* if you want to learn how to use conan virtual environments.

#### Created files

- activate.{sh|bat|ps1}
- deactivate.{sh|bat|ps1}

#### Usage

Linux/macOS:

```
> source activate.sh
```

Windows:

```
> activate.bat
```

#### Variables declared

| ENVIRONMENT VAR | VALUE |
|---|---|
| PS1 | New shell prompt value corresponding to the current directory name |
| OLD_PS1 | Old PS1 value, to recover it in deactivation |
| *XXXX* | Any variable declared in the `self.env_info` object of the requirements. |

### 14.4.18 virtualbuildenv

This is the reference page for `virtualbuildenv` generator. Go to *Mastering/Virtual Environments* if you want to learn how to use Conan virtual environments.

#### Created files

- *activate_build.{sh|bat}*
- *deactivate_build.{sh|bat}*

#### Usage

Linux/macOS:

```
$ source activate_build.sh
```

Windows:

```
$ activate_build.bat
```

#### Variables declared

| ENVIRONMENT VAR | DESCRIPTION |
|---|---|
| LIBS | Library names to link |
| LDFLAGS | Link flags, (-L, -m64, -m32) |
| CFLAGS | Options for the C compiler (-g, -s, -m64, -m32, -fPIC) |
| CXXFLAGS | Options for the C++ compiler (-g, -s, -stdlib, -m64, -m32, -fPIC) |
| CPPFLAGS | Preprocessor definitions (-D, -I) |
| LIB | Library paths separated with ";" (Visual Studio) |
| CL | "/I" flags with include directories (Visual Studio) |

In the case of using this generator to compile with Visual Studio, it also sets the environment variables needed via `tools.vcvars()` to build your project. Some of these variables are:

```
VSINSTALLDIR=C:/Program Files (x86)/Microsoft Visual Studio/2017/Community/
WINDIR=C:/WINDOWS
WindowsLibPath=C:/Program Files (x86)/Windows Kits/10/UnionMetadata/10.0.16299.0;
WindowsSdkBinPath=C:/Program Files (x86)/Windows Kits/10/bin/
WindowsSdkDir=C:/Program Files (x86)/Windows Kits/10/
WindowsSDKLibVersion=10.0.16299.0/
WindowsSdkVerBinPath=C:/Program Files (x86)/Windows Kits/10/bin/10.0.16299.0/
```

### 14.4.19 virtualrunenv

This is the reference page for `virtualrunenv` generator. Go to *Mastering/Virtual Environments* if you want to learn how to use conan virtual environments.

#### Created files

- activate_run.{sh|bat}
- deactivate_run.{sh|bat}

#### Usage

Linux/macOS:

```
> source activate_run.sh
```

Windows:

```
> activate_run.bat
```

#### Variables declared

| ENVIRONMENT VAR | DESCRIPTION |
|---|---|
| PATH | With every `bin` folder of your requirements. |
| LD_LIBRARY_PATH | `lib` folders of your requirements. |
| DYLD_LIBRARY_PATH | `lib` folders of your requirements. |

### 14.4.20 youcompleteme

Go to *Integrations/YouCompleteMe* to see the details of the YouCompleteMe generator.

### 14.4.21 txt

This is the reference page for `txt` generator. Go to *Integrations/Custom integrations / Use the text generator* to know how to use it.

### File format

The generated `conanbuildinfo.txt` file is a generic config file with `[sections]` and values.

### Package declared vars

For each requirement `conanbuildinfo.txt` file declares the following sections. `XXX` is the name of the require in lowercase. e.k "zlib" for `zlib/1.2.8@lasote/stable` requirement:

| SECTION | DESCRIPTION |
|---|---|
| [include_dirs_XXX] | List with the include paths of the requirement |
| [libdirs_XXX] | List with library paths of the requirement |
| [bindirs_XXX] | List with binary directories of the requirement |
| [resdirs_XXX] | List with the resource directories of the requirement |
| [builddirs_XXX] | List with the build directories of the requirement |
| [libs_XXX] | List with library names of the requirement |
| [defines_XXX] | List with the defines of the requirement |
| [cflags_XXX] | List with C compilation flags |
| [sharedlinkflags_XXX] | List with shared libraries link flags |
| [exelinkflags_XXX] | List with executable link flags |
| [cppflags_XXX] | List with C++ compilation flags |
| [rootpath_XXX] | Root path of the package |

#### Global declared vars

Conan also declares some global variables with the aggregated values of all our requirements. The values are ordered in the right order according to the dependency tree.

| SECTION | DESCRIPTION |
|---|---|
| [include_dirs] | List with the aggregated include paths of the requirements |
| [libdirs] | List with aggregated library paths of the requirements |
| [bindirs] | List with aggregated binary directories of the requirements |
| [resdirs] | List with the aggregated resource directories of the requirements |
| [builddirs] | List with the aggregated build directories of the requirements |
| [libs] | List with aggregated library names of the requirements |
| [defines] | List with the aggregated defines of the requirements |
| [cflags] | List with aggregated C compilation flags |
| [sharedlinkflags] | List with aggregated shared libraries link flags |
| [exelinkflags] | List with aggregated executable link flags |
| [cppflags] | List with aggregated C++ compilation flags |

## 14.4.22 json

A file named *conanbuildinfo.json* will be generated. It will contain the information about every dependency and the installed settings and options:

```
{
  "deps_env_info": {
    "MY_ENV_VAR": "foo"
  },
  "deps_user_info": {
```

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```
    "Hello": {
      "my_var": "my_value"
    }
  },
  "dependencies":
  [
    {
      "name": "fmt",
      "version": "4.1.0",
      "include_paths": [
        "/path/to/.conan/data/fmt/4.1.0/<user>/<channel>/package/<id>/include"
      ],
      "lib_paths": [
        "/path/to/.conan/data/fmt/4.1.0/<user>/<channel>/package/<id>/lib"
      ],
      "libs": [
        "fmt"
      ],
      "...": "...",
    },
    {
      "name": "Poco",
      "version": "1.7.8p3",
      "...": "..."
    }
  ],
  "settings": {
    "os": "Linux",
    "arch": "armv7"
  },
  "options": {
    "curl": {
      "shared": true,
    }
  }
}
```

The generated `conanbuildinfo.json` file is a json file with the following keys:

### dependencies

The dependencies is a list, with each item belonging to one dependency, and each one with the following keys: - name - version - description - rootpath - sysroot - include_paths, lib_paths, bin_paths, build_paths, res_paths - libs - defines, cflags, cppflags, sharedlinkflags, exelinkflags

Please note it is an ordered list, not a map, and dependency order is relevant. Upstream dependencies, i.e. the ones that do not depend on other packages, will be first, and their direct dependencies after them, and so on.

### deps_env_info

The environment variables defined by upstream dependencies

#### deps_user_info

The user variables defined by upstream dependencies

#### settings

The settings used during *conan install*

#### options

The options of each dependency

### 14.4.23 *premake* [EXPERIMENTAL]

This is the reference page for `premake` generator. Go to *Integrations/premake* if you want to learn how to integrate your project or recipes with premake.

Generates a file name `conanbuildinfo.lua` that can be used for your premake builds (both premake 4 and premake 5 are supported). The file contains:

- N groups of variables, one group per require, declaring the same individual values: include dirs, libs, bin dirs, defines, etc.
- One group of global variables with aggregated values for all requirements.

**Package declared vars**

For each requirement `conanbuildinfo.lua` file declares the following variables. `` `XXX` `` is the name of the require. e.g. "zlib" for `zlib/1.2.11@lasote/stable` requirement:

| NAME | VALUE |
|---|---|
| conan_includedirs_XXX | Headers's folders (default {CONAN_XXX_ROOT}/include) |
| conan_libdirs_XXX | Library folders (default {CONAN_XXX_ROOT}/lib) |
| conan_bindirs_XXX | Binary folders (default {CONAN_XXX_ROOT}/bin) |
| conan_libs_XXX | Library names to link |
| conan_cppdefines_XXX | Compile definitions |
| conan_cppflags_XXX | CXX flags |
| conan_cflags_XXX | C flags |
| conan_sharedlinkflags_XXX | Shared link flags |
| conan_exelinkflags_XXX | Executable link flags |
| conan_rootpath_XXX | Abs path to root package folder |

**Global declared vars**

| NAME | VALUE |
|---|---|
| conan_includedirs | Aggregated headers's folders |
| conan_libdirs | Aggregated library folders |
| conan_bindirs | Aggregated binary folders |
| conan_libs | Aggregated library names to link |
| conan_cppdefines | Aggregated compile definitions |
| conan_cppflags | Aggregated CXX flags |
| conan_cflags | Aggregated C flags |
| conan_sharedlinkflags | Aggregated shared link flags |
| conan_exelinkflags | Aggregated executable link flags |

## 14.5 Profiles

Profiles allows users to set a complete configuration set for **settings**, **options**, **environment variables**, and **build requirements** in a file. They have this structure:

```
[settings]
setting=value

[options]
MyLib:shared=True

[env]
env_var=value

[build_requires]
Tool1/0.1@user/channel
Tool2/0.1@user/channel, Tool3/0.1@user/channel
*: Tool4/0.1@user/channel
```

Profile files can be used with `-pr`/`--profile` option in **`conan install`** and **`conan create`** commands.

```
$ conan create . demo/testing -pr=myprofile
```

Profiles can be located in different folders. For example, the default *<userhome>/.conan/profiles*, and be referenced by absolute or relative path:

```
$ conan install . --profile /abs/path/to/profile  # abs path
$ conan install . --profile ./relpath/to/profile  # resolved to current dir
$ conan install . --profile profile  # resolved to user/.conan/profiles/profile
```

Listing existing profiles in the *profiles* folder can be done like this:

```
$ conan profile list
default
myprofile1
myprofile2
...
```

You can also show profile's content:

```
$ conan profile show myprofile1
Configuration for profile myprofile1:
```

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```
[settings]
os=Windows
arch=x86_64
compiler=Visual Studio
compiler.version=15
build_type=Release
[options]
[build_requires]
[env]
```

Use `$PROFILE_DIR` in your profile and it will be replaced with the absolute path to the profile file. It is useful to declare relative folders:

```
[env]
PYTHONPATH=$PROFILE_DIR/my_python_tools
```

**Tip:** You can manage your profiles and share them using *conan config install*.

### 14.5.1 Package settings and env vars

Profiles also support **package settings** and **package environment variables** definition, so you can override some settings or environment variables for some specific package:

Listing 5: *.conan/profiles/zlib_with_clang*

```
[settings]
zlib:compiler=clang
zlib:compiler.version=3.5
zlib:compiler.libcxx=libstdc++11
compiler=gcc
compiler.version=4.9
compiler.libcxx=libstdc++11

[env]
zlib:CC=/usr/bin/clang
zlib:CXX=/usr/bin/clang++
```

Your build tool will locate **clang** compiler only for the **zlib** package and **gcc** (default one) for the rest of your dependency tree.

**Note:** If you want to override existing system environment variables, you should use the `key=value` syntax. If you need to pre-pend to the system environment variables you should use the syntax `key=[value]` or `key=[value1, value2, ...]`. A typical example is the `PATH` environment variable, when you want to add paths to the existing system PATH, not override it, you would use:

```
[env]
PATH=[/some/path/to/my/tool]
```

### 14.5.2 Profile includes

You can include other profiles using the `include()` statement. The path can be relative to the current profile, absolute, or a profile name from the default profile location in the local cache.

The `include()` statement has to be at the top of the profile file:

Listing 6: *gcc_49*

```
[settings]
compiler=gcc
compiler.version=4.9
compiler.libcxx=libstdc++11
```

Listing 7: *myprofile*

```
include(gcc_49)

[settings]
zlib:compiler=clang
zlib:compiler.version=3.5
zlib:compiler.libcxx=libstdc++11

[env]
zlib:CC=/usr/bin/clang
zlib:CXX=/usr/bin/clang++
```

### 14.5.3 Variable declaration

In a profile you can declare variables that will be replaced automatically by Conan before the profile is applied. The variables have to be declared at the top of the file, after the `include()` statements.

Listing 8: *myprofile*

```
include(gcc_49)
CLANG=/usr/bin/clang

[settings]
zlib:compiler=clang
zlib:compiler.version=3.5
zlib:compiler.libcxx=libstdc++11

[env]
zlib:CC=$CLANG/clang
zlib:CXX=$CLANG/clang++
```

The variables will be inherited too, so you can declare variables in a profile and then include the profile in a different one, all the variables will be available:

Listing 9: *gcc_49*

```
GCC_PATH=/my/custom/toolchain/path/

[settings]
compiler=gcc
```

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```
compiler.version=4.9
compiler.libcxx=libstdc++11
```

Listing 10: *myprofile*

```
include(gcc_49)

[settings]
zlib:compiler=clang
zlib:compiler.version=3.5
zlib:compiler.libcxx=libstdc++11

[env]
zlib:CC=$GCC_PATH/gcc
zlib:CXX=$GCC_PATH/g++
```

### 14.5.4 Examples

If you are working with Linux and you usually work with **gcc** compiler, but you have installed **clang** compiler and want to install some package for `clang` compiler, you could do:

- Create a `.conan/profiles/clang` file:

```
[settings]
compiler=clang
compiler.version=3.5
compiler.libcxx=libstdc++11

[env]
CC=/usr/bin/clang
CXX=/usr/bin/clang++
```

- Execute an install command passing the **`--profile`** or **`-pr`** parameter:

```
$ conan install . --profile clang
```

Without profiles you would have needed to set CC and CXX variables in the environment to point to your clang compiler and use **`-s`** parameters to specify the settings:

```
$ export CC=/usr/bin/clang
$ export CXX=/usr/bin/clang++
$ conan install -s compiler=clang -s compiler.version=3.5 -s compiler.
↪libcxx=libstdc++11
```

A profile can also be used in **`conan create`** and **`conan info`**:

```
$ conan create . demo/testing --profile clang
```

**See also:**

- Check the section *Build requirements* to read more about its usage in a profile.
- Check *conan profile* and *profiles/default* for full reference.
- Related section: *Cross building*.

## 14.6 Build helpers

Build helpers are Python wrappers of a build tool that help with the conversion of the Conan settings to the build system's ones. They assist users with the compilation of libraries and applications in the `build()` method of a recipe.

Contents:

### 14.6.1 CMake

The *CMake* class helps us to invoke *cmake* command with the generator, flags and definitions, reflecting the specified Conan settings.

There are two ways to invoke your cmake tools:

- Using the helper attributes `cmake.command_line` and `cmake.build_config`:

```
from conans import ConanFile, CMake

 class ExampleConan(ConanFile):
     ...

     def build(self):
         cmake = CMake(self)
         self.run('cmake "%s" %s' % (self.source_folder, cmake.command_line))
         self.run('cmake --build . %s' % cmake.build_config)
         self.run('cmake --build . --target install')
```

- Using the helper methods:

```
from conans import ConanFile, CMake

class ExampleConan(ConanFile):
    ...

    def build(self):
        cmake = CMake(self)
        # same as cmake.configure(source_folder=self.source_folder, build_folder=self.
↪build_folder)
        cmake.configure()
        cmake.build()
        cmake.test() # Build the "RUN_TESTS" or "test" target
        # Build the "install" target, defining CMAKE_INSTALL_PREFIX to self.package_
↪folder
        cmake.install()
```

#### Constructor

```
class CMake(object):

    def __init__(self, conanfile, generator=None, cmake_system_name=True,
                 parallel=True, build_type=None, toolset=None, make_program=None,
                 set_cmake_flags=False)
```

**Parameters:**

- **conanfile** (Required): Conanfile object. Usually `self` in a *conanfile.py*
- **generator** (Optional, Defaulted to `None`): Specify a custom generator instead of autodetect it. e.g., "MinGW Makefiles"
- **cmake_system_name** (Optional, Defaulted to `True`): Specify a custom value for `CMAKE_SYSTEM_NAME` instead of autodetect it.
- **parallel** (Optional, Defaulted to `True`): If `True`, will append the *-jN* attribute for parallel building being N the *cpu_count()*.
- **build_type** (Optional, Defaulted to `None`): Force the build type to be declared in `CMAKE_BUILD_TYPE`. If you set this parameter the build type not will be taken from the settings.
- **toolset** (Optional, Defaulted to `None`): Specify a toolset for Visual Studio.
- **make_program** (Optional, Defaulted to `None`): Indicate path to `make`.
- **set_cmake_flags** (Optional, Defaulted to `None`): Whether or not to set CMake flags like `CMAKE_CXX_FLAGS`, `CMAKE_C_FLAGS`, etc.

### Attributes

#### verbose

**Defaulted to**: `False`

Set it to `True` or `False` to automatically set the definition `CMAKE_VERBOSE_MAKEFILE`.

```
from conans import ConanFile, CMake

class ExampleConan(ConanFile):
    ...

    def build(self):
        cmake = CMake(self)
        cmake.verbose = True
        cmake.configure()
        cmake.build()
```

#### command_line (read only)

Generator, conan definitions and flags that reflects the specified Conan settings.

```
-G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release ... -DCONAN_C_FLAGS=-m64 -Wno-dev
```

#### build_config (read only)

Value for `--config` option for Multi-configuration IDEs.

```
--config Release
```

### definitions

The CMake helper will automatically append some definitions based on your settings:

| Variable | Description |
|---|---|
| CMAKE_BUILD_TYPE | Debug or Release (from self.settings.build_type) |
| CMAKE_OSX_ARCHITECTURES | "i386" if architecture is x86 in an OSX system |
| BUILD_SHARED_LIBS | Only If your conanfile has a "shared" option |
| CONAN_COMPILER | Conan internal variable to check compiler |
| CMAKE_SYSTEM_NAME | If detected cross building it's set to self.settings.os |
| CMAKE_SYSTEM_VERSION | If detected cross building it's set to the self.settings.os_version |
| CMAKE_ANDROID_ARCH_ABI | If detected cross building to Android |
| CONAN_LIBCXX | from self.settings.compiler.libcxx |
| CONAN_CMAKE_SYSTEM_PROCESSOR | Definition only set if same environment variable is declared by user |
| CONAN_CMAKE_FIND_ROOT_PATH | Definition only set if same environment variable is declared by user |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_PROGRAM | Definition only set if same environment variable is declared by user |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_LIBRARY | Definition only set if same environment variable is declared by user |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_INCLUDE | Definition only set if same environment variable is declared by user |
| CONAN_CMAKE_POSITION_INDEPENDENT_CODE | When `fPIC` option is present and True or when `fPIC` is present and False but option `shared` is present and True |
| CONAN_SHARED_LINKER_FLAGS | -m32 and -m64 based on your architecture |
| CONAN_C_FLAGS | -m32 and -m64 based on your architecture and /MP for MSVS |
| CONAN_CXX_FLAGS | -m32 and -m64 based on your architecture and /MP for MSVS |
| CONAN_LINK_RUNTIME | Runtime from self.settings.compiler.runtime for MSVS |
| CONAN_CMAKE_CXX_STANDARD | From setting `cppstd` |
| CONAN_CMAKE_CXX_EXTENSIONS | From setting `cppstd`, when GNU extensions are enabled |
| CONAN_STD_CXX_FLAG | From setting `cppstd`. Flag for compiler directly (for CMake < 3.1) |
| CMAKE_EXPORT_NO_PACKAGE_REGISTRY | By default, disable the package registry |
| CONAN_IN_LOCAL_CACHE | `ON` if installing the package (runs in local cache), `OFF` if running in a user folder |
| CONAN_EXPORTED | Defined when CMake is called using Conan CMake helper |

There are some definitions set to be used later on the the `install()` step too:

| Variable | Description |
|---|---|
| CMAKE_INSTALL_PREFIX | Set to `conanfile.package_folder` |
| CMAKE_INSTALL_BINDIR | Set to *bin* inside the package folder. |
| CMAKE_INSTALL_SBINDIR | Set to *bin* inside the package folder. |
| CMAKE_INSTALL_LIBEXECDIR | Set to *bin* inside the package folder. |
| CMAKE_INSTALL_LIBDIR | Set to *lib* inside the package folder. |
| CMAKE_INSTALL_INCLUDEDIR | Set to *include* inside the package folder. |
| CMAKE_INSTALL_OLDINCLUDEDIR | Set to *include* inside the package folder. |
| CMAKE_INSTALL_DATAROOTDIR | Set to *share* inside the package folder. |

But you can change the automatic definitions after the `CMake()` object creation using the `definitions` property:

```
from conans import ConanFile, CMake

class ExampleConan(ConanFile):
    ...
```

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```
    def build(self):
        cmake = CMake(self)
        cmake.definitions["CMAKE_SYSTEM_NAME"] = "Generic"
        cmake.configure()
        cmake.build()
        cmake.install() # Build --target=install
```

### Methods

#### configure()

```
def configure(self, args=None, defs=None, source_folder=None, build_folder=None,
              cache_build_folder=None, pkg_config_paths=None)
```

Configures *CMake* project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `cmake` command. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`
- **definitions** (Optional, Defaulted to `None`): A dict that will be converted to a list of CMake command line variable definitions of the form `-DKEY=VALUE`. Each value will be escaped according to the current shell and can be either `str`, `bool` or of numeric type
- **source_folder**: CMake's source directory where `CMakeLists.txt` is located. The default value is the `self.source_folder`. Relative paths are allowed and will be relative to `self.source_folder`.
- **build_folder**: CMake's output directory. The default value is the `self.build_folder` if `None` is specified. The `CMake` object will store `build_folder` internally for subsequent calls to `build()`.
- **cache_build_folder** (Optional, Defaulted to `None`): Use the given subfolder as build folder when building the package in the local cache. This argument doesn't have effect when the package is being built in user folder with **`conan build`** but overrides **build_folder** when working in the local cache. See *self.in_local_cache*.
- **pkg_config_paths** (Optional, Defaulted to `None`): Specify folders (in a list) of relative paths to the install folder or absolute ones where to find `*.pc` files (by using the env var `PKG_CONFIG_PATH`). If `None` is specified but the conanfile is using the `pkg_config` generator, the `self.install_folder` will be added to the `PKG_CONFIG_PATH` in order to locate the pc files of the requirements of the conanfile.

#### build()

```
def build(self, args=None, build_dir=None, target=None)
```

Builds *CMake* project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `cmake` command. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`

- **build_dir** (Optional, Defaulted to `None`): CMake's output directory. If `None` is specified the `build_dir` from `configure()` will be used.
- **target** (Optional, Defaulted to `None`): Specifies the target to execute. The default *all* target will be built if `None` is specified. `"install"` can be used to relocate files to aid packaging.

### test()

```
def test(args=None, build_dir=None, target=None)
```

Build *CMake* test target (could be RUN_TESTS in multi-config projects or `test` in single-config projects), which usually means building and running unit tests

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `cmake` command. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`.
- **build_dir** (Optional, Defaulted to `None`): CMake's output directory. If `None` is specified the `build_folder` from `configure()` will be used.
- **target** (Optional, default to `None`). Alternative target name for running the tests. If not defined RUN_TESTS or `test` will be used

### install()

```
def install(args=None, build_dir=None)
```

Installs *CMake* project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `cmake` command. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`.
- **build_dir** (Optional, Defaulted to `None`): CMake's output directory. If `None` is specified the `build_folder` from `configure()` will be used.

### patch_config_paths() [EXPERIMENTAL]

```
def patch_config_paths()
```

> **Warning:** This is an **experimental** feature subject to breaking changes in future releases.

This method changes references to the absolute path of the installed package in exported CMake config files to the appropriate Conan variable. Method also changes references to other packages installation paths in export CMake config files to Conan variable with their installation roots. This makes most CMake config files portable.

For example, if a package foo installs a file called *fooConfig.cmake* to be used by cmake's `find_package()` method, normally this file will contain absolute paths to the installed package folder, for example it will contain a line such as:

```
SET(Foo_INSTALL_DIR /home/developer/.conan/data/Foo/1.0.0/...)
```

This will cause cmake's `find_package()` method to fail when someone else installs the package via Conan. This function will replace such paths to:

```
SET(Foo_INSTALL_DIR ${CONAN_FOO_ROOT})
```

Which is a variable that is set by *conanbuildinfo.cmake*, so that `find_package()` now correctly works on this Conan package.

For dependent packages method replaces lines with references to dependencies installation paths such as:

```
SET_TARGET_PROPERTIES(foo PROPERTIES INTERFACE_INCLUDE_DIRECTORIES "/home/developer/.
↪conan/data/Bar/1.0.0/user/channel/id/include")
```

to following lines:

```
SET_TARGET_PROPERTIES(foo PROPERTIES INTERFACE_INCLUDE_DIRECTORIES "${CONAN_BAR_ROOT}/
↪include")
```

If the `install()` method of the CMake object in the conanfile is used, this function should be called **after** that invocation. For example:

```
def build(self):
    cmake = CMake(self)
    cmake.configure()
    cmake.build()
    cmake.install()
    cmake.patch_config_paths()
```

### get_version()

```
@staticmethod
def get_version()
```

Returns the CMake version in a `conans.model.Version` object as it is evaluated by the command line. Will raise if cannot resolve it to valid version.

### Environment variables

There are some environment variables that will also affect the `CMake()` helper class. Check them in the *CMAKE RELATED VARIABLES* section.

### Example

The following example of `conanfile.py` shows you how to manage a project with conan and CMake.

```
from conans import ConanFile, CMake

class SomePackage(ConanFile):
    name = "SomePackage"
    version = "1.0.0"
```

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```
    settings = "os", "compiler", "build_type", "arch"
    generators = "cmake"

def configure_cmake(self):
    cmake = CMake(self)

    # put definitions here so that they are re-used in cmake between
    # build() and package()
    cmake.definitions["SOME_DEFINITION_NAME"] = "On"

    cmake.configure()
    return cmake

def build(self):
    cmake = self.configure_cmake()
    cmake.build()

    # run unit tests after the build
    cmake.test()

    # run custom make command
    self.run("make -j3 check)

def package(self):
    cmake = self.configure_cmake()
    cmake.install()
```

### 14.6.2 AutoToolsBuildEnvironment (configure/make)

If you are using **configure/make** you can use **AutoToolsBuildEnvironment** helper. This helper sets `LIBS`, `LDFLAGS`, `CFLAGS`, `CXXFLAGS` and `CPPFLAGS` environment variables based on your requirements.

```
from conans import ConanFile, AutoToolsBuildEnvironment

class ExampleConan(ConanFile):
   settings = "os", "compiler", "build_type", "arch"
   requires = "Poco/1.9.0@pocoproject/stable"
   default_options = {"Poco:shared": True, "OpenSSL:shared": True}

   def imports(self):
      self.copy("*.dll", dst="bin", src="bin")
      self.copy("*.dylib*", dst="bin", src="lib")

   def build(self):
      autotools = AutoToolsBuildEnvironment(self)
      autotools.configure()
      autotools.make()
```

It also works using the *environment_append* context manager applied to your **configure and make** commands, calling *configure* and *make* manually:

```
from conans import ConanFile, AutoToolsBuildEnvironment

class ExampleConan(ConanFile):
    ...
```

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```
    def build(self):
        env_build = AutoToolsBuildEnvironment(self)
        with tools.environment_append(env_build.vars):
            self.run("./configure")
            self.run("make")
```

You can change some variables like `fpic`, `libs`, `include_paths` and `defines` before accessing the `vars` to override an automatic value or add new values:

```
from conans import ConanFile, AutoToolsBuildEnvironment

class ExampleConan(ConanFile):
    ...

    def build(self):
        env_build = AutoToolsBuildEnvironment(self)
        env_build.fpic = True
        env_build.libs.append("pthread")
        env_build.defines.append("NEW_DEFINE=23")
        env_build.configure()
        env_build.make()
```

You can use it also with `MSYS2/MinGW` subsystems installed by setting the *win_bash* parameter in the constructor. It will run the the `configure` and `make` commands inside a `bash` that has to be in the path or declared in `CONAN_BASH_PATH`:

```
from conans import ConanFile, AutoToolsBuildEnvironment
import platform

class ExampleConan(ConanFile):
   settings = "os", "compiler", "build_type", "arch"

   def imports(self):
     self.copy("*.dll", dst="bin", src="bin")
     self.copy("*.dylib*", dst="bin", src="lib")

   def build(self):
      in_win = platform.system() == "Windows"
      env_build = AutoToolsBuildEnvironment(self, win_bash=in_win)
      env_build.configure()
      env_build.make()
```

### Constructor

```
class AutoToolsBuildEnvironment(object):

    def __init__(self, conanfile, win_bash=False)
```

**Parameters:**

- **conanfile** (Required): Conanfile object. Usually `self` in a conanfile.py
- **win_bash**: (Optional, Defaulted to `False`): When True, it will run the configure/make commands inside a bash.

### Attributes

You can adjust the automatically filled values modifying the attributes like this:

```
from conans import ConanFile, AutoToolsBuildEnvironment

class ExampleConan(ConanFile):
    ...

    def build(self):
        autotools = AutoToolsBuildEnvironment(self)
        autotools.fpic = True
        autotools.libs.append("pthread")
        autotools.defines.append("NEW_DEFINE=23")
        autotools.configure()
        autotools.make()
```

### fpic

**Defaulted to: `True` if `fPIC` option exists and `True` or when `fPIC` exists and** `False` but option `shared` exists and `True`. Otherwise `None`.

Set it to `True` if you want to append the `-fPIC` flag.

### libs

List with library names of the requirements (`-l` in `LIBS`).

### include_paths

List with the include paths of the requires (-I in CPPFLAGS).

### library_paths

List with library paths of the requirements (-L in LDFLAGS).

### defines

List with variables that will be defined with `-D` in `CPPFLAGS`.

### flags

List with compilation flags (`CFLAGS` and `CXXFLAGS`).

### cxx_flags

List with only C++ compilation flags (`CXXFLAGS`).

#### link_flags

List with linker flags

### Properties

#### vars

Environment variables `CPPFLAGS`, `CXXFLAGS`, `CFLAGS`, `LDFLAGS`, `LIBS` generated by the build helper to use them in the configure, make and install steps. This variables are generated dynamically with the values of the attributes and can also be modified to be used in the following configure, make or install steps:

```
def build():
    auotools = AutoToolsBuildEnvironment()
    autotools.fpic = True
    env_build_vars = autotools.vars
    env_build_vars['RCFLAGS'] = '-O COFF'
    autotools.configure(vars=env_build_vars)
    autotools.make(vars=env_build_vars)
    autotools.install(vars=env_build_vars)
```

#### vars_dict

Same behavior as `vars` but this property returns each variable `CPPFLAGS`, `CXXFLAGS`, `CFLAGS`, `LDFLAGS`, `LIBS` as dictionaries.

### Methods

#### configure()

```
def configure(self, configure_dir=None, args=None, build=None, host=None, target=None,
              pkg_config_paths=None, vars=None)
```

Configures *Autotools* project with the given parameters.

---

**Important:** This method sets by default the `--prefix` argument to `self.package_folder` whenever `--prefix` is not provided in the `args` parameter during the configure step.

There are other flags set automatically to fix the install directories by default:

- `--bindir`, `--sbindir` and `--libexecdir` set to *bin* folder.
- `--libdir` set to *lib* folder.
- `--includedir`, `--oldincludedir` set to *include* folder.
- `--datarootdir` set to *share* folder.

These flags will be set on demand, so only the available options in the *./configure* are actually set. They can also be totally skipped using `use_default_install_dirs=False` as described in the section below.

---

**Warning:** Since Conan 1.8 this build helper sets the output library directory via `--libdir` automatically to `${prefix}/lib`. This means that if you are using the `install()` method to package with AutoTools, library artifacts will be stored in the `lib` directory unless indicated explicitly by the user.

This change was introduced in order to fix issues detected in some Linux distributions where libraries were being installed to the `lib64` folder (instead of `lib`) when rebuilding a package from sources. In those cases, if `package_info()` was declaring `self.cpp_info.libdirs` as `lib`, the consumption of the package was broken.

This was considered a bug in the build helper, as it should be as much deterministic as possible when building the same package for the same settings and generally for any other user input.

If you were already modeling the `lib64` folder in your recipe, make sure you use `lib` for `self.cpp_info.libdirs` or inject the argument in the Autotools' `configure()` method:

```
atools = AutoToolsBuildEnvironment()
atools.configure(args=["--libdir=${prefix}/lib64"])
atools.install()
```

You can also skip its default value using the parameter `use_default_install_dirs=False`.

**Parameters:**

- **configure_dir** (Optional, Defaulted to `None`): Directory where the `configure` script is. If `None`, it will use the current directory.
- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `configure` script. Each argument will be escaped according to the current shell. `--prefix` and `--libdir`, will be adjusted automatically if not indicated specifically.
- **build** (Optional, Defaulted to `None`): To specify a value for the parameter `--build`. If `None` it will try to detect the value if cross-building is detected according to the settings. If `False`, it will not use this argument at all.
- **host** (Optional, Defaulted to `None`): To specify a value for the parameter `--host`. If `None` it will try to detect the value if cross-building is detected according to the settings. If `False`, it will not use this argument at all.
- **target** (Optional, Defaulted to `None`): To specify a value for the parameter `--target`. If `None` it will try to detect the value if cross-building is detected according to the settings. If `False`, it will not use this argument at all.
- **pkg_config_paths** (Optional, Defaulted to `None`): Specify folders (in a list) of relative paths to the install folder or absolute ones where to find `*.pc` files (by using the env var `PKG_CONFIG_PATH`). If `None` is specified but the conanfile is using the `pkg_config` generator, the `self.install_folder` will be added to the `PKG_CONFIG_PATH` in order to locate the pc files of the requirements of the conanfile.
- **vars** (Optional, Defaulted to `None`): Overrides custom environment variables in the configure step.
- **use_default_install_dirs** (Optional, Defaulted to `True`): Use or not the defaulted installation dirs such as `--libdir`, `--bindir`...

### make()

```
def make(self, args="", make_program=None, target=None, vars=None)
```

Builds *Autotools* project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `""`): A list of additional arguments to be passed to the `make` command. Each argument will be escaped accordingly to the current shell. No extra arguments will be added if `args=""`.
- **make_program** (Optional, Defaulted to `None`): Allows to specify a different `make` executable, e.g., `mingw32-make`. The environment variable *CONAN_MAKE_PROGRAM* can be used too.
- **target** (Optional, Defaulted to `None`): Choose which target to build. This allows building of e.g., docs, shared libraries or install for some AutoTools projects.
- **vars** (Optional, Defaulted to `None`): Overrides custom environment variables in the make step.

#### install()

```
def install(self, args="", make_program=None, vars=None)
```

Performs the install step of autotools calling `make(target="install")`.

**Parameters:**

- **args** (Optional, Defaulted to `""`): A list of additional arguments to be passed to the `make` command. Each argument will be escaped accordingly to the current shell. No extra arguments will be added if `args=""`.
- **make_program** (Optional, Defaulted to `None`): Allows to specify a different `make` executable, e.g., `mingw32-make`. The environment variable *CONAN_MAKE_PROGRAM* can be used too.
- **vars** (Optional, Defaulted to `None`): Overrides custom environment variables in the install step.

#### Environment variables

The following environment variables will also affect the *AutoToolsBuildEnvironment* helper class.

| NAME | DESCRIPTION |
|---|---|
| LIBS | Library names to link |
| LDFLAGS | Link flags, (-L, -m64, -m32) |
| CFLAGS | Options for the C compiler (-g, -s, -m64, -m32, -fPIC) |
| CXXFLAGS | Options for the C++ compiler (-g, -s, -stdlib, -m64, -m32, -fPIC, -std) |
| CPPFLAGS | Preprocessor definitions (-D, -I) |

**See also:**

- *Reference/Tools/environment_append*

### 14.6.3 MSBuild

Calls Visual Studio :command:'msbuild' command to build a *.sln* project:

```
from conans import ConanFile, MSBuild

class ExampleConan(ConanFile):
    ...

    def build(self):
        msbuild = MSBuild(self)
        msbuild.build("MyProject.sln")
```

Internally the `MSBuild` build helper uses *VisualStudioBuildEnvironment* to adjust the `LIB` and `CL` environment variables with all the information from the requirements: include directories, library names, flags etc. and then calls **`msbuild`**.

You can adjust all the information from the requirements accessing to the `build_env` that it is a *VisualStudioBuildEnvironment* object:

```
from conans import ConanFile, MSBuild

class ExampleConan(ConanFile):
    ...

    def build(self):
        msbuild = MSBuild(self)
        msbuild.build_env.include_paths.append("mycustom/directory/to/headers")
        msbuild.build_env.lib_paths.append("mycustom/directory/to/libs")
        msbuild.build_env.link_flags = []

        msbuild.build("MyProject.sln")
```

### Constructor

```
class MSBuild(object):

    def __init__(self, conanfile)
```

**Parameters:**

- **conanfile** (Required): ConanFile object. Usually `self` in a *conanfile.py*.

### Attributes

### build_env

A *VisualStudioBuildEnvironment* object with the needed environment variables.

### Methods

### build()

```
def build(self, project_file, targets=None, upgrade_project=True, build_type=None,␣
↪arch=None,
          parallel=True, force_vcvars=False, toolset=None, platforms=None, use_
↪env=True,
          vcvars_ver=None, winsdk_version=None, properties=None)
```

Builds Visual Studio project with the given parameters.

**Parameters:**

- **project_file** (Required): Path to the *.sln* file.
- **targets** (Optional, Defaulted to `None`): List of targets to build.

- **upgrade_project** (Optional, Defaulted to `True`): Will call **`devenv`** to upgrade the solution to your current Visual Studio.
- **build_type** (Optional, Defaulted to `None`): Use a custom build type name instead of the default `settings.build_type` one.
- **arch** (Optional, Defaulted to `None`): Use a custom architecture name instead of the `settings.arch` one. It will be used to build the `/p:Configuration=` parameter of `msbuild`. It can be used as the key of the **platforms** parameter. E.g. `arch="x86", platforms={"x86": "i386"}`
- **force_vcvars** (Optional, Defaulted to `False`): Will ignore if the environment is already set for a different Visual Studio version.
- **parallel** (Optional, Defaulted to `True`): Will use the configured number of cores in the *conan.conf* file or *tools.cpu_count()*:
  - **In the solution**: Building the solution with the projects in parallel. (`/m:` parameter).
  - **CL compiler**: Building the sources in parallel. (`/MP:` compiler flag)
- **toolset** (Optional, Defaulted to `None`): Specify a toolset. Will append a `/p:PlatformToolset` option.
- **platforms** (Optional, Defaulted to `None`): Dictionary with the mapping of archs/platforms from Conan naming to another one. It is useful for Visual Studio solutions that have a different naming in architectures. Example: `platforms={"x86":"Win32"}` (Visual solution uses "Win32" instead of "x86"). This dictionary will update the default one:

```
msvc_arch = {'x86': 'x86',
             'x86_64': 'x64',
             'armv7': 'ARM',
             'armv8': 'ARM64'}
```

- **use_env** (Optional, Defaulted to `True`: Applies the argument `/p:UseEnv=true` to the **`msbuild`** call.
- **vcvars_ver** (Optional, Defaulted to `None`): Specifies the Visual Studio compiler toolset to use.
- **winsdk_version** (Optional, Defaulted to `None`): Specifies the version of the Windows SDK to use.
- **properties** (Optional, Defaulted to `None`): Dictionary with new properties, for each element in the dictionary `{name: value}` it will append a `/p:name="value"` option.

**Note:** The `MSBuild()` build helper will, before calling to `msbuild`, call *vcvars_command* to adjust the environment according to the settings. When cross-building from x64 to x86 the toolchain by default is `x86`. If you want to use `amd64_x86` instead, set the environment variable `PreferredToolArchitecture=x64`.

### get_command()

Returns a string command calling **`msbuild`**.

```
def get_command(self, project_file, props_file_path=None, targets=None, upgrade_
↪project=True, build_type=None,
                arch=None, parallel=True, toolset=None, platforms=None, use_
↪env=False):
```

**Parameters:**

- Same parameters as the `build()` method.

### 14.6.4 VisualStudioBuildEnvironment

Prepares the needed environment variables to invoke the Visual Studio compiler. Use it together with *tools.vcvars_command()*.

```
from conans import ConanFile, VisualStudioBuildEnvironment

class ExampleConan(ConanFile):

    ...

    def build(self):
        if self.settings.compiler == "Visual Studio":
            env_build = VisualStudioBuildEnvironment(self)
            with tools.environment_append(env_build.vars):
                vcvars = tools.vcvars_command(self.settings)
                self.run('%s && cl /c /EHsc hello.cpp' % vcvars)
                self.run('%s && lib hello.obj -OUT:hello.lib' % vcvars
```

You can adjust the automatically filled attributes:

```
 def build(self):
     if self.settings.compiler == "Visual Studio":
     env_build = VisualStudioBuildEnvironment(self)
     env_build.include_paths.append("mycustom/directory/to/headers")
     env_build.lib_paths.append("mycustom/directory/to/libs")
     env_build.link_flags = []
     with tools.environment_append(env_build.vars):
         vcvars = tools.vcvars_command(self.settings)
         self.run('%s && cl /c /EHsc hello.cpp' % vcvars)
         self.run('%s && lib hello.obj -OUT:hello.lib' % vcvars
```

#### Constructor

```
class VisualStudioBuildEnvironment(object):

    def __init__(self, conanfile, with_build_type_flags=True)
```

**Parameters:**

- **conanfile** (Required): ConanFile object. Usually `self` in a *conanfile.py*.
- **with_build_type_flags** (Optional, Defaulted to `True`): If `True`, it adjusts the compiler flags according to the `build_type` setting. e.g: *-Zi*, *-Ob0*, *-Od*...

#### Environment variables

| NAME | DESCRIPTION |
|---|---|
| LIB | Library paths separated with ";" |
| CL | "/I" flags with include directories, Runtime (/MT, /MD...), Definitions (/DXXX), and any other C and CXX flags. |

### Attributes

#### include_paths

List with directories of include paths.

#### lib_paths

List with directories of libraries.

#### defines

List with definitions from requirements' `cpp_info.defines`.

#### runtime

List with directories from `settings.compiler.runtime`.

#### flags

List with flags from requirements' `cpp_info.cflags`.

#### cxx_flags

List with cxx flags from requirements' `cpp_info.cppflags`.

#### link_flags

List with linker flags from requirements' `cpp_info.sharedlinkflags` and `cpp_info.exelinkflags`

#### std

If the setting `cppstd` is set, the property will contain the corresponding flag of the language standard.

#### parallel

Defaulted to `False`.

Sets the flag `/MP` in order to compile the sources in parallel using cores found by *tools.cpu_count()*.

**See also:**

Read more about *tools.environment_append()*.

### 14.6.5 Meson

If you are using **Meson Build** as your build system, you can use the **Meson** build helper. Specially useful with the *pkg_config* that will generate the *.pc* files of our requirements, then `Meson()` build helper will locate them automatically.

```
from conans import ConanFile, tools, Meson
import os

class ConanFileToolsTest(ConanFile):
    generators = "pkg_config"
    requires = "LIB_A/0.1@conan/stable"
    settings = "os", "compiler", "build_type"

    def build(self):
        meson = Meson(self)
        meson.configure(build_folder="build")
        meson.build()
```

#### Constructor

```
class Meson(object):

    def __init__(self, conanfile, backend=None, build_type=None)
```

**Parameters:**

- **conanfile** (Required): Use `self` inside a `conanfile.py`.
- **backend** (Optional, Defaulted to `None`): Specify a backend to be used, otherwise it will use `"Ninja"`.
- **build_type** (Optional, Defaulted to `None`): Force to use a build type, ignoring the value from the settings.

#### Methods

#### configure()

```
def configure(self, args=None, defs=None, source_folder=None, build_folder=None,
              pkg_config_paths=None, cache_build_folder=None)
```

Configures Meson project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `configure` script. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`.
- **defs** (Optional, Defaulted to `None`): A list of definitions.
- **source_folder** (Optional, Defaulted to `None`): Meson's source directory where `meson.build` is located. The default value is the `self.source_folder`. Relative paths are allowed and will be relative to `self.source_folder`.
- **build_folder** (Optional, Defaulted to `None`): Meson's output directory. The default value is the `self.build_folder` if `None` is specified. The `Meson` object will store `build_folder` internally for subsequent calls to `build()`.

- **pkg_config_paths** (Optional, Defaulted to `None`): A list containing paths to locate the pkg-config files (*.pc). If `None`, it will be set to `conanfile.build_folder`.
- **cache_build_folder** (Optional, Defaulted to `None`): Subfolder to be used as build folder when building the package in the local cache. This argument doesn't have effect when the package is being built in user folder with **`conan build`** but overrides **build_folder** when working in the local cache. See *self.in_local_cache*.

### build()

```
def build(self, args=None, build_dir=None, targets=None)
```

Builds *Meson* project with the given parameters.

**Parameters:**

- **args** (Optional, Defaulted to `None`): A list of additional arguments to be passed to the `make` command. Each argument will be escaped according to the current shell. No extra arguments will be added if `args=None`.
- **build_dir** (Optional, Defaulted to `None`): Build folder. If `None`, it will be set to `conanfile.build_folder`.
- **targets** (Optional, Defaulted to `None`): A list of targets to be built. No targets will be added if `targets=None`.

### Example

A typical usage of the Meson build helper, if you want to be able to both execute **`conan create`** and also build your package for a library locally (in your user folder, not in the local cache), could be:

```
from conans import ConanFile, Meson

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"
    settings = "os", "compiler", "build_type", "arch"
    generators = "pkg_config"
    exports_sources = "src/*"
    requires = "zlib/1.2.11@conan/stable"

    def build(self):
        meson = Meson(self)
        meson.configure(source_folder="%s/src" % self.source_folder,
                        build_folder="build")
        meson.build()

    def package(self):
        self.copy("*.h", dst="include", src="src")
        self.copy("*.lib", dst="lib", keep_path=False)
        self.copy("*.dll", dst="bin", keep_path=False)
        self.copy("*.dylib*", dst="lib", keep_path=False)
        self.copy("*.so", dst="lib", keep_path=False)
        self.copy("*.a", dst="lib", keep_path=False)

    def package_info(self):
        self.cpp_info.libs = ["hello"]
```

Note the `pkg_config` generator, which generates *.pc* files (*zlib.pc* from the example above ), which are understood by Meson to process dependencies information (no need for a `meson` generator).

The layout is:

```
<folder>
  | - conanfile.py
  | - src
      | - meson.build
      | - hello.cpp
      | - hello.h
```

And the *meson.build* could be as simple as:

```
project('hello',
        'cpp',
        version : '0.1.0'
        default_options : ['cpp_std=c++11']
        )

library('hello',
        ['hello.cpp'],
        dependencies: [dependency('zlib')]
        )
```

This allows, to create the package with **`conan create`** as well as to build the package locally:

```
$ cd <folder>
$ conan create . user/testing
# Now local build
$ mkdir build && cd build
$ conan install ..
$ conan build ..
```

### 14.6.6 RunEnvironment

The `RunEnvironment` helper prepares `PATH`, `LD_LIBRARY_PATH` and `DYLD_LIBRARY_PATH` environment variables to locate shared libraries and executables of your requirements at runtime.

> **Warning:** The `RunEnvironment` is no longer needed, at least explicitly in *conanfile.py*. It has been integrated into the `self.run(..., run_environment=True)` argument. Check *self.run()*.

This helper is specially useful if:

- You are requiring packages with shared libraries and you are running some executable that needs those libraries.
- You have a requirement with some tool (executable) and you need it to be in the path.

```
from conans import ConanFile, RunEnvironment

class ExampleConan(ConanFile):
   ...

   def build(self):
       env_build = RunEnvironment(self)
```

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```
        with tools.environment_append(env_build.vars):
            self.run("....")
            # All the requirements bin folder will be available at PATH
            # All the lib folders will be available in LD_LIBRARY_PATH and DYLD_LIBRARY_
↪PATH
```

It sets the following environment variables:

| NAME | DESCRIPTION |
|---|---|
| PATH | Containing all the requirements `bin` folders. |
| LD_LIBRARY_PATH | Containing all the requirements `lib` folders. (Linux) |
| DYLD_LIBRARY_PATH | Containing all the requirements `lib` folders. (OSX) |

**Important:** Security restrictions might apply in OSX (read this thread), so the `DYLD_LIBRARY_PATH` environment variable is not directly transferred to the child process. In that case, you have to use it explicitly in your *conanfile.py*:

```
def build(self):
    env_build = RunEnvironment(self)
    with tools.environment_append(env_build.vars):
        # self.run('./myexetool") # won't work, even if 'DYLD_LIBRARY_PATH' is in the␣
↪env
        self.run('DYLD_LIBRARY_PATH=%s ./myexetool" % os.environ['DYLD_LIBRARY_PATH'])
```

This is already handled automatically by the `self.run(..., run_environment=True)` argument.

**See also:**

- *Manage Shared Libraries with Environment Variables*
- *tools.environment_append()*

## 14.7 Tools

Under the tools module there are several functions and utilities that can be used in conan package recipes:

```
from conans import ConanFile
from conans import tools

class ExampleConan(ConanFile):
    ...
```

### 14.7.1 tools.cpu_count()

```
def tools.cpu_count()
```

Returns the number of CPUs available, for parallel builds. If processor detection is not enabled, it will safely return 1. Can be overwritten with the environment variable `CONAN_CPU_COUNT` and configured in the *conan.conf file*.

### 14.7.2 tools.vcvars_command()

```
def vcvars_command(settings, arch=None, compiler_version=None, force=False, vcvars_
↪ver=None,
                   winsdk_version=None)
```

Returns, for given settings, the command that should be called to load the Visual Studio environment variables for a certain Visual Studio version. It wraps the functionality of vcvarsall but does not execute the command, as that typically have to be done in the same command as the compilation, so the variables are loaded for the same subprocess. It will be typically used in the `build()` method, like this:

```
from conans import tools

def build(self):
    if self.settings.build_os == "Windows":
        vcvars = tools.vcvars_command(self.settings)
        build_command = ...
        self.run("%s && configure %s" % (vcvars, " ".join(args)))
        self.run("%s && %s %s" % (vcvars, build_command, " ".join(build_args)))
```

The `vcvars_command` string will contain something like `call "%vsXX0comntools%../../VC/vcvarsall.bat"` for the corresponding Visual Studio version for the current settings.

This is typically not needed if using `CMake`, as the cmake generator will handle the correct Visual Studio version.

If **arch** or **compiler_version** is specified, it will ignore the settings and return the command to set the Visual Studio environment for these parameters.

**Parameters:**

- **settings** (Required): Conanfile settings. Use `self.settings`.
- **arch** (Optional, Defaulted to `None`): Will use `settings.arch`.
- **compiler_version** (Optional, Defaulted to `None`): Will use `settings.compiler.version`.
- **force** (Optional, Defaulted to `False`): Will ignore if the environment is already set for a different Visual Studio version.
- **winsdk_version** (Optional, Defaulted to `None`): Specifies the version of the Windows SDK to use.
- **vcvars_ver** (Optional, Defaulted to `None`): Specifies the Visual Studio compiler toolset to use.

---

**Note:** When cross-building from x64 to x86 the toolchain by default is `x86`. If you want to use `amd64_x86` instead, set the environment variable `PreferredToolArchitecture=x64`.

---

### 14.7.3 tools.vcvars_dict()

```
vcvars_dict(settings, arch=None, compiler_version=None, force=False, filter_known_
↪paths=False,
            vcvars_ver=None, winsdk_version=None, only_diff=True)
```

Returns a dictionary with the variables set by the **tools.vcvars_command** that can be directly applied to `tools.environment_append`.

The values of the variables `INCLUDE`, `LIB`, `LIBPATH` and `PATH` will be returned as a list, so when used with `tools.environment_append`, the previous environment values that these variables could have, will be appended automatically.

```
from conans import tools

def build(self):
    env_vars = tools.vcvars_dict(self.settings):
    with tools.environment_append(env_vars):
        # Do something
```

**Parameters:**

- Same as `vcvars_command`.
- **filter_known_paths** (Optional, Defaulted to `False`): When True, the function will only keep the PATH entries that follows some known patterns, filtering all the non-Visual Studio ones. When False, it will keep the PATH will all the system entries.
- **only_diff** (Optional, Defaulted to `True`): When True, the command will return only the variables set by `vcvarsall` and not the whole environment. If *vcvars* modifies an environment variable by appending values to the old value (separated by `;`), only the new values will be returned, as a list.

### 14.7.4 tools.vcvars()

```
vcvars(settings, arch=None, compiler_version=None, force=False, filter_known_
↪paths=False)
```

**Note:** This context manager tool has no effect if used in a platform different from Windows.

This is a context manager that allows to append to the environment all the variables set by the **tools.vcvars_dict()**. You can replace **tools.vcvars_command()** and use this context manager to get a cleaner way to activate the Visual Studio environment:

```
from conans import tools

def build(self):
    with tools.vcvars(self.settings):
        do_something()
```

### 14.7.5 tools.build_sln_command() (DEPRECATED)

**Warning:** This tool is deprecated and will be removed in Conan 2.0. Use *MSBuild()* build helper instead.

```
def build_sln_command(settings, sln_path, targets=None, upgrade_project=True, build_
↪type=None,
                      arch=None, parallel=True, toolset=None, platforms=None)
```

Returns the command to call *devenv* and *msbuild* to build a Visual Studio project. It's recommended to use it along with `vcvars_command()`, so that the Visual Studio tools will be in path.

```
from conans import tools

def build(self):
    build_command = build_sln_command(self.settings, "myfile.sln", targets=["SDL2_
↪image"])
    command = "%s && %s" % (tools.vcvars_command(self.settings), build_command)
    self.run(command)
```

**Parameters:**

- **settings** (Required): Conanfile settings. Use "self.settings".
- **sln_path** (Required): Visual Studio project file path.
- **targets** (Optional, Defaulted to `None`): List of targets to build.
- **upgrade_project** (Optional, Defaulted to `True`): If `True`, the project file will be upgraded if the project's VS version is older than current. When *CONAN_SKIP_VS_PROJECTS_UPGRADE* environment variable is set to `True`/`1`, this parameter will be ignored and the project won't be upgraded.
- **build_type** (Optional, Defaulted to `None`): Override the build type defined in the settings (`settings.build_type`).
- **arch** (Optional, Defaulted to `None`): Override the architecture defined in the settings (`settings.arch`).
- **parallel** (Optional, Defaulted to `True`): Enables VS parallel build with `/m:X` argument, where X is defined by CONAN_CPU_COUNT environment variable or by the number of cores in the processor by default.
- **toolset** (Optional, Defaulted to `None`): Specify a toolset. Will append a `/p:PlatformToolset` option.
- **platforms** (Optional, Defaulted to `None`): Dictionary with the mapping of archs/platforms from Conan naming to another one. It is useful for Visual Studio solutions that have a different naming in architectures. Example: `platforms={"x86":"Win32"}` (Visual solution uses "Win32" instead of "x86"). This dictionary will update the default one:

```
msvc_arch = {'x86': 'x86',
             'x86_64': 'x64',
             'armv7': 'ARM',
             'armv8': 'ARM64'}
```

### 14.7.6 tools.msvc_build_command() (DEPRECATED)

**Warning:** This tool is deprecated and will be removed in Conan 2.0. Use *MSBuild()*.get_command() instead.

```
def msvc_build_command(settings, sln_path, targets=None, upgrade_project=True, build_
↪type=None,
                       arch=None, parallel=True, force_vcvars=False, toolset=None,␣
↪platforms=None)
```

Returns a string with a joint command consisting in setting the environment variables via `vcvars.bat` with the above `tools.vcvars_command()` function, and building a Visual Studio project with the `tools.build_sln_command()` function.

**Parameters:**

- Same parameters as the above *tools.build_sln_command()*.
- **force_vcvars**: Optional. Defaulted to False. Will set `vcvars_command(force=force_vcvars)`.

### 14.7.7 tools.unzip()

```
def unzip(filename, destination=".", keep_permissions=False, pattern=None)
```

Function mainly used in `source()`, but could be used in `build()` in special cases, as when retrieving pre-built binaries from the Internet.

This function accepts `.tar.gz`, `.tar`, `.tzb2`, `.tar.bz2`, `.tgz`, `.txz`, `tar.xz`, and `.zip` files, and decompresses them into the given destination folder (the current one by default).

```
from conans import tools

tools.unzip("myfile.zip")
# or to extract in "myfolder" sub-folder
tools.unzip("myfile.zip", "myfolder")
```

You can keep the permissions of the files using the `keep_permissions=True` parameter.

```
from conans import tools

tools.unzip("myfile.zip", "myfolder", keep_permissions=True)
```

Use the `pattern=None` parameter if you want to filter specific files and paths to decompress from the archive.

```
from conans import tools

# Extract only files inside relative folder "small"
tools.unzip("bigfile.zip", pattern="small/*")
# Extract only txt files
tools.unzip("bigfile.zip", pattern="*.txt")
```

**Parameters:**

- **filename** (Required): File to be unzipped.
- **destination** (Optional, Defaulted to `"."`): Destination folder for unzipped files.
- **keep_permissions** (Optional, Defaulted to `False`): Keep permissions of files. **WARNING:** Can be dangerous if the zip was not created in a NIX system, the bits could produce undefined permission schema. Use only this option if you are sure that the zip was created correctly.
- **pattern** (Optional, Defaulted to `None`): Extract from the archive only paths matching the pattern. This should be a Unix shell-style wildcard, see fnmatch documentation for more details.

### 14.7.8 tools.untargz()

```
def untargz(filename, destination=".", pattern=None)
```

Extract tar gz files (or in the family). This is the function called by the previous `unzip()` for the matching extensions, so generally not needed to be called directly, call `unzip()` instead unless the file had a different extension.

```
from conans import tools

tools.untargz("myfile.tar.gz")
# or to extract in "myfolder" sub-folder
tools.untargz("myfile.tar.gz", "myfolder")
# or to extract only txt files
tools.untargz("myfile.tar.gz", pattern="*.txt")
```

**Parameters:**

- **filename** (Required): File to be unzipped.
- **destination** (Optional, Defaulted to `"."`): Destination folder for *untargzed* files.
- **pattern** (Optional, Defaulted to `None`): Extract from the archive only paths matching the pattern. This should be a Unix shell-style wildcard, see fnmatch documentation for more details.

### 14.7.9 tools.get()

```
def get(url, filename="", md5="", sha1="", sha256="", keep_permissions=False,␣
↪pattern=None)
```

Just a high level wrapper for download, unzip, and remove the temporary zip file once unzipped. You can pass hash checking parameters: `md5`, `sha1`, `sha256`. All the specified algorithms will be checked, if any of them doesn't match, it will raise a `ConanException`.

```
from conans import tools

tools.get("http://url/file", md5='d2da0cd0756cd9da6560b9a56016a0cb')
# also, specify a destination folder
tools.get("http://url/file", destination="subfolder")
```

**Parameters:**

- **url** (Required): URL to download.
- **filename** (Optional, Defaulted to `""`): Specify the name of the compressed file if it cannot be deduced from the URL.
- **md5** (Optional, Defaulted to `""`): MD5 hash code to check the downloaded file.
- **sha1** (Optional, Defaulted to `""`): SHA1 hash code to check the downloaded file.
- **sha256** (Optional, Defaulted to `""`): SHA256 hash code to check the downloaded file.
- **keep_permissions** (Optional, Defaulted to `False`): Propagates the parameter to *tools.unzip()*.
- **pattern** (Optional, Defaulted to `None`): Propagates the parameter to *tools.unzip()*.

### 14.7.10 tools.get_env()

```
def get_env(env_key, default=None, environment=None)
```

Parses an environment and cast its value against the **default** type passed as an argument.

Following python conventions, returns **default** if **env_key** is not defined.

See an usage example with an environment variable defined while executing conan

```
$ TEST_ENV="1" conan <command> ...
```

```
from conans import tools

tools.get_env("TEST_ENV") # returns "1", returns current value
tools.get_env("TEST_ENV_NOT_DEFINED") # returns None, TEST_ENV_NOT_DEFINED not␣
↪declared
tools.get_env("TEST_ENV_NOT_DEFINED", []) # returns [], TEST_ENV_NOT_DEFINED not␣
↪declared
tools.get_env("TEST_ENV", "2") # returns "1"
tools.get_env("TEST_ENV", False) # returns True (default value is boolean)
tools.get_env("TEST_ENV", 2) # returns 1
tools.get_env("TEST_ENV", 2.0) # returns 1.0
tools.get_env("TEST_ENV", []) # returns ["1"]
```

**Parameters:**

- **env_key** (Required): environment variable name.
- **default** (Optional, Defaulted to `None`): default value to return if not defined or cast value against.
- **environment** (Optional, Defaulted to `None`): `os.environ` if `None` or environment dictionary to look for.

### 14.7.11 tools.download()

```
def download(url, filename, verify=True, out=None, retry=2, retry_wait=5,␣
↪overwrite=False,
             auth=None, headers=None)
```

Retrieves a file from a given URL into a file with a given filename. It uses certificates from a list of known verifiers for https downloads, but this can be optionally disabled.

```
from conans import tools

tools.download("http://someurl/somefile.zip", "myfilename.zip")

# to disable verification:
tools.download("http://someurl/somefile.zip", "myfilename.zip", verify=False)

# to retry the download 2 times waiting 5 seconds between them
tools.download("http://someurl/somefile.zip", "myfilename.zip", retry=2, retry_wait=5)

# Use https basic authentication
tools.download("http://someurl/somefile.zip", "myfilename.zip", auth=("user",
↪"password"))

# Pass some header
tools.download("http://someurl/somefile.zip", "myfilename.zip", headers={"Myheader":
↪"My value"})
```

**Parameters:**

- **url** (Required): URL to download
- **filename** (Required): Name of the file to be created in the local storage
- **verify** (Optional, Defaulted to `True`): When False, disables https certificate validation.

- **out**: (Optional, Defaulted to `None`): An object with a write() method can be passed to get the output, stdout will use if not specified.
- **retry** (Optional, Defaulted to `2`): Number of retries in case of failure.
- **retry_wait** (Optional, Defaulted to `5`): Seconds to wait between download attempts.
- **overwrite**: (Optional, Defaulted to `False`): When *True* Conan will overwrite the destination file if exists, if False it will raise.
- **auth** (Optional, Defaulted to `None`): A tuple of user, password can be passed to use HTTPBasic authentication. This is passed directly to the requests python library, check here other uses of the **auth** parameter: http://docs.python-requests.org/en/master/user/authentication
- **headers** (Optional, Defaulted to `None`): A dict with additional headers.

### 14.7.12 tools.ftp_download()

```
def ftp_download(ip, filename, login="", password="")
```

Retrieves a file from an FTP server. Right now it doesn't support SSL, but you might implement it yourself using the standard python FTP library, and also if you need some special functionality.

```
from conans import tools

def source(self):
    tools.ftp_download('ftp.debian.org', "debian/README")
    self.output.info(load("README"))
```

**Parameters:**

- **ip** (Required): The IP or address of the ftp server.
- **filename** (Required): The filename, including the path/folder where it is located.
- **login** (Optional, Defaulted to `""`): Login credentials for the ftp server.
- **password** (Optional, Defaulted to `""`): Password credentials for the ftp server.

### 14.7.13 tools.replace_in_file()

```
def replace_in_file(file_path, search, replace, strict=True)
```

This function is useful for a simple "patch" or modification of source files. A typical use would be to augment some library existing `CMakeLists.txt` in the `source()` method, so it uses Conan dependencies without forking or modifying the original project:

```
from conans import tools

def source(self):
    # get the sources from somewhere
    tools.replace_in_file("hello/CMakeLists.txt", "PROJECT(MyHello)",
        '''PROJECT(MyHello)
           include(${CMAKE_BINARY_DIR}/conanbuildinfo.cmake)
           conan_basic_setup()''')
```

**Parameters:**

- **file_path** (Required): File path of the file to perform the replace in.
- **search** (Required): String you want to be replaced.
- **replace** (Required): String to replace the searched string.
- **strict** (Optional, Defaulted to `True`): If `True`, it raises an error if the searched string is not found, so nothing is actually replaced.

### 14.7.14 tools.replace_path_in_file()

```
def replace_path_in_file(file_path, search, replace, strict=True, windows_paths=None)
```

Replace a path in a file with another string. In Windows, it will match the path even if the casing and the path separator doesn't match.

```
from conans import tools

def build(self):
    tools.replace_path_in_file("hello/somefile.cmake", "c:\Some/PATH/to\File.txt",
↪"PATTERN/file.txt")
```

**Parameters:**

- **file_path** (Required): File path of the file to perform the replace in.
- **search** (Required): String with the path you want to be replaced.
- **replace** (Required): String to replace the searched path.
- **strict** (Optional, Defaulted to `True`): If `True`, it raises an error if the search string is not found and nothing is actually replaced.
- **windows_paths** (Optional, Defaulted to `None`): Controls whether the casing of the path and the different directory separators are taken into account:
  - `None`: Only when Windows operating system is detected.
  - `False`: Deactivated, it will match exact patterns (like `tools.replace_in_file()`).
  - `True`: Always activated, irrespective of the detected operating system.

### 14.7.15 tools.run_environment()

```
def run_environment(conanfile)
```

Context manager that sets temporary environment variables set by *RunEnvironment*.

### 14.7.16 tools.check_with_algorithm_sum()

```
def check_with_algorithm_sum(algorithm_name, file_path, signature)
```

Useful to check that some downloaded file or resource has a predefined hash, so integrity and security are guaranteed. Something that could be typically done in `source()` method after retrieving some file from the internet.

**Parameters:**

- **algorithm_name** (Required): Name of the algorithm to be checked.

- **file_path** (Required): File path of the file to be checked.
- **signature** (Required): Hash code that the file should have.

There are specific functions for common algorithms:

```
def check_sha1(file_path, signature)
def check_md5(file_path, signature)
def check_sha256(file_path, signature)
```

For example:

```
from conans import tools

tools.check_sha1("myfile.zip", "eb599ec83d383f0f25691c184f656d40384f9435")
```

Other algorithms are also possible, as long as are recognized by python `hashlib` implementation, via `hashlib.new(algorithm_name)`. The previous is equivalent to:

```
from conans import tools

tools.check_with_algorithm_sum("sha1", "myfile.zip",
                               "eb599ec83d383f0f25691c184f656d40384f9435")
```

### 14.7.17 tools.patch()

```
def patch(base_path=None, patch_file=None, patch_string=None, strip=0, output=None)
```

Applies a patch from a file or from a string into the given path. The patch should be in diff (unified diff) format. To be used mainly in the `source()` method.

```
from conans import tools

tools.patch(patch_file="file.patch")
# from a string:
patch_content = " real patch content ..."
tools.patch(patch_string=patch_content)
# to apply in subfolder
tools.patch(base_path=mysubfolder, patch_string=patch_content)
```

If the patch to be applied uses alternate paths that have to be stripped, like:

```
--- old_path/text.txt\t2016-01-25 17:57:11.452848309 +0100
+++ new_path/text_new.txt\t2016-01-25 17:57:28.839869950 +0100
@@ -1 +1 @@
- old content
+ new content
```

Then it can be done specifying the number of folders to be stripped from the path:

```
from conans import tools

tools.patch(patch_file="file.patch", strip=1)
```

**Parameters:**

- **base_path** (Optional, Defaulted to `None`): Base path where the patch should be applied.

- **patch_file** (Optional, Defaulted to `None`): Patch file that should be applied.
- **patch_string** (Optional, Defaulted to `None`): Patch string that should be applied.
- **strip** (Optional, Defaulted to `0`): Number of folders to be stripped from the path.
- **output** (Optional, Defaulted to `None`): Stream object.

### 14.7.18 tools.environment_append()

```
def environment_append(env_vars)
```

This is a context manager that allows to temporary use environment variables for a specific piece of code in your conanfile:

```
from conans import tools

def build(self):
    with tools.environment_append({"MY_VAR": "3", "CXX": "/path/to/cxx"}):
        do_something()
```

The environment variables will be overridden if the value is a string, while it will be prepended if the value is a list. When the context manager block ends, the environment variables will be unset.

**Parameters:**

- **env_vars** (Required): Dictionary object with environment variable name and its value.

### 14.7.19 tools.chdir()

```
def chdir(newdir)
```

This is a context manager that allows to temporary change the current directory in your conanfile:

```
from conans import tools

def build(self):
    with tools.chdir("./subdir"):
        do_something()
```

**Parameters:**

- **newdir** (Required): Directory path name to change the current directory.

### 14.7.20 tools.pythonpath()

> **Warning:** This way of reusing python code from other recipes can be improved via `python_requires()`. See this section: *Python requires: reusing python code in recipes*

This tool is automatically applied in the conanfile methods unless *apply_env* is deactivated, so any PYTHONPATH inherited from the requirements will be automatically available.

```
def pythonpath(conanfile)
```

This is a context manager that allows to load the PYTHONPATH for dependent packages, create packages with python code, and reuse that code into your own recipes.

It is automatically applied

```
from conans import tools

def build(self):
    with tools.pythonpath(self):
        from module_name import whatever
        whatever.do_something()
```

When the *apply_env* is activated (default) the above code could be simplified as:

```
from conans import tools

def build(self):
    from module_name import whatever
    whatever.do_something()
```

For that to work, one of the dependencies of the current recipe, must have a `module_name` file or folder with a `whatever` file or object inside, and should have declared in its `package_info()`:

```
from conans import tools

def package_info(self):
    self.env_info.PYTHONPATH.append(self.package_folder)
```

**Parameters:**

- **conanfile** (Required): Current `ConanFile` object.

### 14.7.21 tools.no_op()

```
def no_op()
```

Context manager that performs nothing. Useful to condition any other context manager to get a cleaner code:

```
from conans import tools

def build(self):
    with tools.chdir("some_dir") if self.options.myoption else tools.no_op():
        # if not self.options.myoption, we are not in the "some_dir"
        pass
```

### 14.7.22 tools.human_size()

```
def human_size(size_bytes)
```

Will return a string from a given number of bytes, rounding it to the most appropriate unit: GB, MB, KB, etc. It is mostly used by the conan downloads and unzip progress, but you can use it if you want too.

```
from conans import tools

tools.human_size(1024)
>> 1.0KB
```

**Parameters:**

- **size_bytes** (Required): Number of bytes.

### 14.7.23 tools.OSInfo and tools.SystemPackageTool

These are helpers to install system packages. Check *system_requirements()*.

### 14.7.24 tools.cross_building()

```
def cross_building(settings, self_os=None, self_arch=None)
```

Reading the settings and the current host machine it returns `True` if we are cross building a conan package:

```
from conans import tools

if tools.cross_building(self.settings):
    # Some special action
```

**Parameters:**

- **settings** (Required): Conanfile settings. Use `self.settings`.
- **self_os** (Optional, Defaulted to `None`): Current operating system where the build is being done.
- **self_arch** (Optional, Defaulted to `None`): Current architecture where the build is being done.

### 14.7.25 tools.get_gnu_triplet()

```
def get_gnu_triplet(os_, arch, compiler=None)
```

Returns string with GNU like `<machine>-<vendor>-<op_system>` triplet.

**Parameters:**

- **os_** (Required): Operating system to be used to create the triplet.
- **arch** (Required): Architecture to be used to create the triplet.
- **compiler** (Optional, Defaulted to `None`): Compiler used to create the triplet (only needed for Windows).

### 14.7.26 tools.run_in_windows_bash()

```
def run_in_windows_bash(conanfile, bashcmd, cwd=None, subsystem=None, msys_mingw=True,
↪ env=None)
```

Runs a UNIX command inside a bash shell. It requires to have "bash" in the path. Useful to build libraries using `configure` and `make` in Windows. Check *Windows subsytems* section.

You can customize the path of the bash executable using the environment variable `CONAN_BASH_PATH` or the *conan.conf* `bash_path` variable to change the default bash location.

```
from conans import tools

command = "pwd"
tools.run_in_windows_bash(self, command) # self is a conanfile instance
```

**Parameters:**

- **conanfile** (Required): Current `ConanFile` object.
- **bashcmd** (Required): String with the command to be run.
- **cwd** (Optional, Defaulted to `None`): Path to directory where to apply the command from.
- **subsystem** (Optional, Defaulted to `None` will autodetect the subsystem). Used to escape the command according to the specified subsystem.
- **msys_mingw** (Optional, Defaulted to `True`) If the specified subsystem is MSYS2, will start it in MinGW mode (native windows development).
- **env** (Optional, Defaulted to `None`) You can pass a dict with environment variable to be applied **at first place** so they will have more priority than others.

### 14.7.27 tools.get_cased_path()

```
get_cased_path(abs_path)
```

For Windows, for any `abs_path` parameter containing a case-insensitive absolute path, returns it case-sensitive, that is, with the real cased characters. Useful when using Windows subsystems where the file system is case-sensitive.

### 14.7.28 tools.remove_from_path()

```
remove_from_path(command)
```

This is a context manager that allows you to remove a tool from the PATH. Conan will locate the executable (using `tools.which()`) and will remove from the PATH the directory entry that contains it. It's not necessary to specify the extension.

```
from conans import tools

with tools.remove_from_path("make"):
    self.run("some command")
```

### 14.7.29 tools.unix_path()

```
def unix_path(path, path_flavor=None)
```

Used to translate Windows paths to MSYS/CYGWIN unix paths like `c/users/path/to/file`.

**Parameters:**

- **path** (Required): Path to be converted.

- **path_flavor** (Optional, Defaulted to `None`, will try to autodetect the subsystem): Type of unix path to be returned. Options are `MSYS`, `MSYS2`, `CYGWIN`, `WSL` and `SFU`.

### 14.7.30 tools.escape_windows_cmd()

```
def escape_windows_cmd(command)
```

Useful to escape commands to be executed in a windows bash (msys2, cygwin etc).

- Adds escapes so the argument can be unpacked by `CommandLineToArgvW()`.
- Adds escapes for cmd.exe so the argument survives cmd.exe's substitutions.

**Parameters:**

- **command** (Required): Command to execute.

### 14.7.31 tools.sha1sum(), sha256sum(), md5sum()

```
def def md5sum(file_path)
def sha1sum(file_path)
def sha256sum(file_path)
```

Return the respective hash or checksum for a file:

```
from conans import tools

md5 = tools.md5sum("myfilepath.txt")
sha1 = tools.sha1sum("myfilepath.txt")
```

**Parameters:**

- **file_path** (Required): Path to the file.

### 14.7.32 tools.md5()

```
def md5(content)
```

Returns the MD5 hash for a string or byte object:

```
from conans import tools

md5 = tools.md5("some string, not a file path")
```

**Parameters:**

- **content** (Required): String or bytes to calculate its md5.

### 14.7.33 tools.save()

```
def save(path, content, append=False)
```

Utility function to save files in one line. It will manage the open and close of the file and creating directories if necessary.

```
from conans import tools

tools.save("otherfile.txt", "contents of the file")
```

**Parameters:**

- **path** (Required): Path to the file.
- **content** (Required): Content that should be saved into the file.
- **append** (Optional, Defaulted to `False`): If `True`, it will append the content.

### 14.7.34 tools.load()

```
def load(path, binary=False)
```

Utility function to load files in one line. It will manage the open and close of the file, and load binary encodings. Returns the content of the file.

```
from conans import tools

content = tools.load("myfile.txt")
```

**Parameters:**

- **path** (Required): Path to the file.
- **binary** (Optional, Defaulted to `False`): If `True`, it reads the the file as binary code.

### 14.7.35 tools.mkdir(), tools.rmdir()

```
def mkdir(path)
def rmdir(path)
```

Utility functions to create/delete a directory. The existence of the specified directory is checked, so `mkdir()` will do nothing if the directory already exists and `rmdir()` will do nothing if the directory does not exists.

This makes it safe to use these functions in the `package()` method of a `conanfile.py` when `no_copy_source=True`.

```
from conans import tools

tools.mkdir("mydir") # Creates mydir if it does not already exist
tools.mkdir("mydir") # Does nothing

tools.rmdir("mydir") # Deletes mydir
tools.rmdir("mydir") # Does nothing
```

**Parameters:**

- **path** (Required): Path to the directory.

### 14.7.36 tools.which()

```
def which(filename)
```

Returns the path to a specified executable searching in the `PATH` environment variable. If not found, it returns `None`.

This tool also looks for filenames with following extensions if no extension provided:

- `.com`, `.exe`, `.bat` `.cmd` for Windows.
- `.sh` if not Windows.

```
from conans import tools

abs_path_make = tools.which("make")
```

**Parameters:**

- **filename** (Required): Name of the executable file. It doesn't require the extension of the executable.

### 14.7.37 tools.unix2dos()

```
def unix2dos(filepath)
```

Converts line breaks in a text file from Unix format (LF) to DOS format (CRLF).

```
from conans import tools

tools.unix2dos("project.dsp")
```

**Parameters:**

- **filepath** (Required): The file to convert.

### 14.7.38 tools.dos2unix()

```
def dos2unix(filepath)
```

Converts line breaks in a text file from DOS format (CRLF) to Unix format (LF).

```
from conans import tools

tools.dos2unix("dosfile.txt")
```

**Parameters:**

- **filepath** (Required): The file to convert.

### 14.7.39 tools.touch()

```
def touch(fname, times=None)
```

Updates the timestamp (last access and last modification times) of a file. This is similar to Unix' `touch` command, except the command fails if the file does not exist.

Optionally, a tuple of two numbers can be specified, which denotes the new values for the 'last access' and 'last modified' times respectively.

```
from conans import tools
import time

tools.touch("myfile")                              # Sets atime and mtime to the␣
↪current time
tools.touch("myfile", (time.time(), time.time()) # Similar to above
tools.touch("myfile", (time.time(), 1))          # Modified long, long ago
```

**Parameters:**

- **fname** (Required): File name of the file to be touched.
- **times** (Optional, Defaulted to `None`: Tuple with 'last access' and 'last modified' times.

### 14.7.40 tools.relative_dirs()

```
def relative_dirs(path)
```

Recursively walks a given directory (using `os.walk()`) and returns a list of all contained file paths relative to the given directory.

```
from conans import tools

tools.relative_dirs("mydir")
```

**Parameters:**

- **path** (Required): Path of the directory.

### 14.7.41 tools.vswhere()

```
def vswhere(all_=False, prerelease=False, products=None, requires=None, version="",
            latest=False, legacy=False, property_="", nologo=True)
```

Wrapper of `vswhere` tool to look for details of Visual Studio installations. Its output is always a list with a dictionary for each installation found.

```
from conans import tools

vs_legacy_installations = tool.vswhere(legacy=True)
```

**Parameters:**

- **all_** (Optional, Defaulted to `False`): Finds all instances even if they are incomplete and may not launch.
- **prerelease** (Optional, Defaulted to `False`): Also searches prereleases. By default, only releases are searched.
- **products** (Optional, Defaulted to `None`): List of one or more product IDs to find. Defaults to Community, Professional, and Enterprise. Specify `["*"]` by itself to search all product instances installed.
- **requires** (Optional, Defaulted to `None`): List of one or more workload or component IDs required when finding instances. See https://docs.microsoft.com/en-us/visualstudio/install/workload-and-component-ids?view=vs-2017 for a list of workload and component IDs.

- **version** (Optional, Defaulted to `""`): A version range for instances to find. Example: `"[15.0,16.0)"` will find versions 15.*.
- **latest** (Optional, Defaulted to `False`): Return only the newest version and last installed.
- **legacy** (Optional, Defaulted to `False`): Also searches Visual Studio 2015 and older products. Information is limited. This option cannot be used with either `products` or `requires` parameters.
- **property_** (Optional, Defaulted to `""`): The name of a property to return. Use delimiters `.`, `/`, or `_` to separate object and property names. Example: `"properties.nickname"` will return the "nickname" property under "properties".
- **nologo** (Optional, Defaulted to `True`): Do not show logo information.

### 14.7.42 tools.vs_comntools()

```
def vs_comntools(compiler_version)
```

Returns the value of the environment variable `VS<compiler_version>.0COMNTOOLS` for the compiler version indicated.

```
from conans import tools

vs_path = tools.vs_comntools("14")
```

**Parameters:**

- **compiler_version** (Required): String with the version number: `"14"`, `"12"`...

### 14.7.43 tools.vs_installation_path()

```
def vs_installation_path(version, preference=None)
```

Returns the Visual Studio installation path for the given version. It uses `tools.vswhere()` and `tool.vs_comntools()`. It will also look for the installation paths following `CONAN_VS_INSTALLATION_PREFERENCE` environment variable or the preference parameter itself. If the tool is not able to return the path it returns `None`.

```
from conans import tools

vs_path_2017 = tools.vs_installation_path("15", preference=["Community", "BuildTools",
↪ "Professional", "Enterprise"])
```

**Parameters:**

- **version** (Required): Visual Studio version to locate. Valid version numbers are strings: `"10"`, `"11"`, `"12"`, `"13"`, `"14"`, `"15"`...
- **preference** (Optional, Defaulted to `None`): Set to value of `CONAN_VS_INSTALLATION_PREFERENCE` or defaulted to `["Enterprise", "Professional", "Community", "BuildTools"]`. If only set to one type of preference, it will return the installation path only for that Visual type and version, otherwise `None`.

### 14.7.44 tools.replace_prefix_in_pc_file()

```
def replace_prefix_in_pc_file(pc_file, new_prefix)
```

Replaces the `prefix` variable in a package config file `.pc` with the specified value.

```
from conans import tools

lib_b_path = self.deps_cpp_info["libB"].rootpath
tools.replace_prefix_in_pc_file("libB.pc", lib_b_path)
```

**Parameters:**

- **pc_file** (Required): Path to the pc file
- **new_prefix** (Required): New prefix variable value (Usually a path pointing to a package).

**See also:**

Check section integrations/*pkg-config and pc files* to know more.

### 14.7.45 tools.collect_libs()

```
def collect_libs(conanfile, folder=None)
```

Returns a list of library names from the libraries (files with extensions *.so*, *.lib*, *.a* and *.dylib*) located inside the `conanfile.cpp_info.libdirs` (by default) or the **folder** directory relative to the package folder. Useful to collect not inter-dependent libraries or with complex names like `libmylib-x86-debug-en.lib`.

```
from conans import tools

def package_info(self):
    self.cpp_info.libdirs = ["lib", "other_libdir"]  # Deafult value is 'lib'
    self.cpp_info.libs = tools.collect_libs(self)
```

For UNIX libraries staring with **lib**, like *libmath.a*, this tool will collect the library name **math**.

**Parameters:**

- **conanfile** (Required): A `ConanFile` object to get the `package_folder` and `cpp_info`.
- **folder** (Optional, Defaulted to `None`): String indicating the subfolder name inside `conanfile.package_folder` where the library files are.

**Warning:** This tool collects the libraries searching directly inside the package folder and returns them in no specific order. If libraries are inter-dependent, then `package_info()` method should order them to achieve correct linking order.

### 14.7.46 tools.PkgConfig()

```
class PkgConfig(object):

    def __init__(self, library, pkg_config_executable="pkg-config", static=False,␣
↪msvc_syntax=False, variables=None, print_errors=True)
```

Wrapper of the `pkg-config` tool.

```
from conans import tools

with environment_append({'PKG_CONFIG_PATH': tmp_dir}):
    pkg_config = PkgConfig("libastral")
    print(pkg_config.cflags)
    print(pkg_config.cflags_only_I)
    print(pkg_config.variables)
```

**Parameters of the constructor:**

- **library** (Required): Library (package) name, such as `libastral`.
- **pkg_config_executable** (Optional, Defaulted to `"pkg-config"`): Specify custom pkg-config executable (e.g., for cross-compilation).
- **static** (Optional, Defaulted to `False`): Output libraries suitable for static linking (adds `--static` to `pkg-config` command line).
- **msvc_syntax** (Optional, Defaulted to `False`): MSVC compatibility (adds `--msvc-syntax` to `pkg-config` command line).
- **variables** (Optional, Defaulted to `None`): Dictionary of pkg-config variables (passed as `--define-variable=VARIABLENAME=VARIABLEVALUE`).
- **print_errors** (Optional, Defaulted to `True`): Output error messages (adds –print-errors)

**Properties:**

| PROPERTY | DESCRIPTION |
|---|---|
| .cflags | get all pre-processor and compiler flags |
| .cflags_only_I | get -I flags |
| .cflags_only_other | get cflags not covered by the cflags-only-I option |
| .libs | get all linker flags |
| .libs_only_L | get -L flags |
| .libs_only_l | get -l flags |
| .libs_only_other | get other libs (e.g., -pthread) |
| .provides | get which packages the package provides |
| .requires | get which packages the package requires |
| .requires_private | get packages the package requires for static linking |
| .variables | get list of variables defined by the module |

### 14.7.47 tools.Git()

```
class Git(object):

    def __init__(self, folder=None, verify_ssl=True, username=None, password=None,
                 force_english=True, runner=None):
```

Wrapper of the `git` tool.

Parameters of the constructor:

- **folder** (Optional, Defaulted to `None`): Specify a subfolder where the code will be cloned. If not specified it will clone in the current directory.
- **verify_ssl** (Optional, Defaulted to `True`): Verify SSL certificate of the specified **url**.

- **username** (Optional, Defaulted to `None`): When present, it will be used as the login to authenticate with the remote.
- **password** (Optional, Defaulted to `None`): When present, it will be used as the password to authenticate with the remote.
- **force_english** (Optional, Defaulted to `True`): The encoding of the tool will be forced to use `en_US.UTF-8` to ease the output parsing.
- **runner** (Optional, Defaulted to `None`): By default `subprocess.check_output` will be used to invoke the `git` tool.

Methods:

- **run(command):** Run any "git" command, e.g., `run("status")`
- **get_url_with_credentials(url):** Returns the passed url but containing the `username` and `password` in the URL to authenticate (only if `username` and `password` is specified)
- **clone(url, branch=None):** Clone a repository. Optionally you can specify a branch. Note: If you want to clone a repository and the specified **folder** already exist you have to specify a `branch`.
- **checkout(element, submodule=None):** Checkout a branch, commit or tag given by `element`. Argument `submodule` can get values in `shallow` or `recursive` to instruct what to do with submodules.
- **get_remote_url(remote_name=None):** Returns the remote url of the specified remote. If not `remote_name` is specified `origin` will be used.
- **get_qualified_remote_url():** Returns the remote url (see `get_remote_url()`) but with forward slashes if it is a local folder.
- **get_revision(), get_commit():** Gets the current commit hash.
- **get_branch():** Gets the current branch.
- **excluded_files():** Gets a list of the files and folders that would be excluded by *.gitignore* file.
- **is_local_repository():** Returns *True* if the remote is a local folder.
- **is_pristine():** Returns *True* if there aren't modified or uncommitted files in the working copy.
- **get_repo_root():** Returns the root folder of the working copy.

### 14.7.48 tools.SVN()

```
class SVN(object):

    def __init__(self, folder=None, verify_ssl=True, username=None, password=None,
                 force_english=True, runner=None):
```

Wrapper of the `svn` tool.

Parameters of the constructor:

- **folder** (Optional, Defaulted to `None`): Specify a subfolder where the code will be cloned. If not specified it will clone in the current directory.
- **verify_ssl** (Optional, Defaulted to `True`): Verify SSL certificate of the specified **url**.
- **username** (Optional, Defaulted to `None`): When present, it will be used as the login to authenticate with the remote.
- **password** (Optional, Defaulted to `None`): When present, it will be used as the password to authenticate with the remote.

- **force_english** (Optional, Defaulted to `True`): The encoding of the tool will be forced to use `en_US.UTF-8` to ease the output parsing.
- **runner** (Optional, Defaulted to `None`): By default `subprocess.check_output` will be used to invoke the `svn` tool.

Methods:

- **version():** Retrieve version from the installed SVN client.
- **run(command):** Run any "svn" command, e.g., `run("status")`
- **get_url_with_credentials(url):** Return the passed url but containing the `username` and `password` in the URL to authenticate (only if `username` and `password` is specified)
- **checkout(url, revision="HEAD"):** Checkout the revision number given by `revision` from the specified `url`.
- **update(revision="HEAD"):** Update working copy to revision number given by `revision`.
- **get_remote_url():** Returns the remote url of working copy.
- **get_qualified_remote_url():** Returns the remote url of the working copy with the peg revision appended to it.
- **get_revision():** Gets the current revision number from the repo server.
- **get_last_changed_revision(use_wc_root=True):** Returns the revision number corresponding to the last changed item in the working folder (`use_wc_root=False`) or in the working copy root (`use_wc_root=True`).
- **get_branch():** Tries to deduce the branch name from the standard SVN layout. Will raise if cannot resolve it.
- **excluded_files():** Gets a list of the files and folders that are marked to be ignored.
- **is_local_repository():** Returns *True* if the remote is a local folder.
- **is_pristine():** Returns *True* if there aren't modified or uncommitted files in the working copy.
- **get_repo_root():** Returns the root folder of the working copy.

### 14.7.49 tools.is_apple_os()

```
def is_apple_os(os_)
```

Returns `True` if OS is an Apple one: macOS, iOS, watchOS or tvOS.

**Parameters:**

- **os_** (Required): OS to perform the check. Usually this would be `self.settings.os`.

### 14.7.50 tools.to_apple_arch()

```
def to_apple_arch(arch)
```

Converts conan-style architecture into Apple-style architecture.

**Parameters:**

- **arch** (Required): arch to perform the conversion. Usually this would be `self.settings.arch`.

### 14.7.51 tools.apple_sdk_name()

```
def apple_sdk_name(settings)
```

Returns proper SDK name suitable for OS and architecture you are building for (considering simulators).

**Parameters:**

- **settings** (Required): Conanfile settings.

### 14.7.52 tools.apple_deployment_target_env()

```
def apple_deployment_target_env(os_, os_version)
```

Environment variable name which controls deployment target: `MACOSX_DEPLOYMENT_TARGET`, `IOS_DEPLOYMENT_TARGET`, `WATCHOS_DEPLOYMENT_TARGET` or `TVOS_DEPLOYMENT_TARGET`.

**Parameters:**

- **os_** (Required): OS of the settings. Usually `self.settings.os`.
- **os_version** (Required): OS version.

### 14.7.53 tools.apple_deployment_target_flag()

```
def apple_deployment_target_flag(os_, os_version)
```

Compiler flag name which controls deployment target. For example: `-mappletvos-version-min=9.0`

**Parameters:**

- **os_** (Required): OS of the settings. Usually `self.settings.os`.
- **os_version** (Required): OS version.

### 14.7.54 tools.XCRun()

```
class XCRun(object):

    def __init__(self, settings, sdk=None):
```

XCRun wrapper used to get information for building.

**Properties:**

- **sdk_path**: Obtain SDK path (a.k.a. Apple sysroot or -isysroot).
- **sdk_version**: Obtain SDK version.
- **sdk_platform_path**: Obtain SDK platform path.
- **sdk_platform_version**: Obtain SDK platform version.
- **cc**: Path to C compiler (CC).
- **cxx**: Path to C++ compiler (CXX).
- **ar**: Path to archiver (AR).

- **ranlib**: Path to archive indexer (RANLIB).
- **strip**: Path to symbol removal utility (STRIP).

### 14.7.55 tools.latest_vs_version_installed()

```
def latest_vs_version_installed()
```

Returns a string with the major version of latest Microsoft Visual Studio available on machine. If no Microsoft Visual Studio installed, it returns `None`.

## 14.8 Configuration files

These are the most important configuration files, used to customize conan.

### 14.8.1 conan.conf

The typical location of the **conan.conf** file is the directory `~/.conan/`:

```
[log]
run_to_output = True        # environment CONAN_LOG_RUN_TO_OUTPUT
run_to_file = False         # environment CONAN_LOG_RUN_TO_FILE
level = 50                  # environment CONAN_LOGGING_LEVEL
# trace_file =              # environment CONAN_TRACE_FILE
print_run_commands = False  # environment CONAN_PRINT_RUN_COMMANDS

[general]
default_profile = default
compression_level = 9                 # environment CONAN_COMPRESSION_LEVEL
sysrequires_sudo = True               # environment CONAN_SYSREQUIRES_SUDO
request_timeout = 60                  # environment CONAN_REQUEST_TIMEOUT (seconds)
# sysrequires_mode = enabled            # environment CONAN_SYSREQUIRES_MODE (allowed␣
↪modes enabled/verify/disabled)
# vs_installation_preference = Enterprise, Professional, Community, BuildTools #␣
↪environment CONAN_VS_INSTALLATION_PREFERENCE
# verbose_traceback = False           # environment CONAN_VERBOSE_TRACEBACK
# bash_path = ""                      # environment CONAN_BASH_PATH (only windows)
# recipe_linter = False               # environment CONAN_RECIPE_LINTER
# read_only_cache = True              # environment CONAN_READ_ONLY_CACHE
# pylintrc = path/to/pylintrc_file    # environment CONAN_PYLINTRC
# cache_no_locks = True               # Disable locking mechanism of local cache
# user_home_short = your_path         # environment CONAN_USER_HOME_SHORT
# use_always_short_paths = False      # environment CONAN_USE_ALWAYS_SHORT_PATHS
# skip_vs_projects_upgrade = False    # environment CONAN_SKIP_VS_PROJECTS_UPGRADE
# non_interactive = False             # environment CONAN_NON_INTERACTIVE

# conan_make_program = make           # environment CONAN_MAKE_PROGRAM (overrides the␣
↪make program used in AutoToolsBuildEnvironment.make)

# cmake_generator                     # environment CONAN_CMAKE_GENERATOR
# http://www.vtk.org/Wiki/CMake_Cross_Compiling
# cmake_toolchain_file                # environment CONAN_CMAKE_TOOLCHAIN_FILE
# cmake_system_name                   # environment CONAN_CMAKE_SYSTEM_NAME
```

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```
# cmake_system_version                # environment CONAN_CMAKE_SYSTEM_VERSION
# cmake_system_processor              # environment CONAN_CMAKE_SYSTEM_PROCESSOR
# cmake_find_root_path                # environment CONAN_CMAKE_FIND_ROOT_PATH
# cmake_find_root_path_mode_program   # environment CONAN_CMAKE_FIND_ROOT_PATH_MODE_
↪PROGRAM
# cmake_find_root_path_mode_library   # environment CONAN_CMAKE_FIND_ROOT_PATH_MODE_
↪LIBRARY
# cmake_find_root_path_mode_include   # environment CONAN_CMAKE_FIND_ROOT_PATH_MODE_
↪INCLUDE

# cpu_count = 1             # environment CONAN_CPU_COUNT

# Change the default location for building test packages to a temporary folder
# which is deleted after the test.
# temp_test_folder = True             # environment CONAN_TEMP_TEST_FOLDER

[storage]
# This is the default path, but you can write your own. It must be an absolute path␣
↪or a
# path beginning with "~" (if the environment var CONAN_USER_HOME is specified, this␣
↪directory, even
# with "~/", will be relative to the conan user home, not to the system user home)
path = ~/.conan/data

[proxies]
# Empty section will try to use system proxies.
# If don't want proxy at all, remove section [proxies]
# As documented in http://docs.python-requests.org/en/latest/user/advanced/#proxies
# http = http://user:pass@10.10.1.10:3128/
# http = http://10.10.1.10:3128
# https = http://10.10.1.10:1080
# You can skip the proxy for the matching (fnmatch) urls (comma-separated)
# no_proxy_match = *bintray.com*, https://myserver.*

[hooks]  # environment CONAN_HOOKS
attribute_checker

# Default settings now declared in the default profile
```

### Log

The `level` variable, defaulted to 50 (critical events), declares the LOG level . If you want to show more detailed logging information, set this variable to lower values, as 10 to show debug information. You can also adjust the environment variable `CONAN_LOGGING_LEVEL`.

The `print_run_commands`, when is 1, Conan will print the executed commands in `self.run` to the output. You can also adjust the environment variable CONAN_PRINT_RUN_COMMANDS

The `run_to_file` variable, defaulted to False, will print the output from the `self.run` executions to the path that the variable specifies. You can also adjust the environment variable `CONAN_LOG_RUN_TO_FILE`.

The `run_to_output` variable, defaulted to 1, will print to the `stdout` the output from the `self.run` executions in the conanfile. You can also adjust the environment variable `CONAN_LOG_RUN_TO_OUTPUT`.

The `trace_file` variable enable extra logging information about your conan command executions. Set it with an absolute path to a file. You can also adjust the environment variable `CONAN_TRACE_FILE`.

### General

The `vs_installation_preference` variable determines the preference of usage when searching a Visual installation. The order of preference by default is Enterprise, Professional, Community and BuildTools. It can be fixed to just one type of installation like only BuildTools. You can also adjust the environment variable `CONAN_VS_INSTALLATION_PREFERENCE`.

The `verbose_traceback` variable will print the complete traceback when an error occurs in a recipe or even in the conan code base, allowing to debug the detected error.

The `bash_path` variable is used only in windows to help the *tools.run_in_windows_bash()* function to locate our Cygwin/MSYS2 bash. Set it with the bash executable path if it's not in the PATH or you want to use a different one.

The `cmake_***` variables will declare the corresponding CMake variable when you use the *cmake generator* and the *CMake build tool*.

The `cpu_count` variable set the number of cores that the *tools.cpu_count()* will return, by default the number of cores available in your machine. Conan recipes can use the cpu_count() tool to build the library using more than one core.

The `pylintrc` variable points to a custom `pylintrc` file that allows configuring custom rules for the python linter executed at `export` time. A use case could be to define some custom indents (though the standard pep8 4-spaces indent is recommended, there are companies that define different styles). The `pylintrc` file has the form:

```
[FORMAT]
indent-string='  '
```

Running `pylint --generate-rcfile` will output a complete rcfile with comments explaining the fields.

The `recipe_linter` variable allows to disable the package recipe analysis (linting) executed at **`conan install`**. Please note that this linting is very recommended, specially for sharing package recipes and collaborating with others.

The `sysrequires_mode` variable, defaulted to `enabled` (allowed modes `enabled/verify/disabled`) controls whether system packages should be installed into the system via `SystemPackageTool` helper, typically used in *system_requirements()*. You can also adjust the environment variable `CONAN_SYSREQUIRES_MODE`.

The `sysrequires_sudo` variable, defaulted to True, controls whether `sudo` is used for installing apt, yum, etc. system packages via `SystemPackageTool`. You can also adjust the environment variable `CONAN_SYSREQUIRES_SUDO`.

The `request_timeout` variable, defaulted to 30 seconds, controls the time after Conan will stop waiting for a response. Timeout is not a time limit on the entire response download; rather, an exception is raised if the server has not issued a response for timeout seconds (more precisely, if no bytes have been received on the underlying socket for timeout seconds). If no timeout is specified explicitly, it do not timeout.

The `user_home_short` specify the base folder to be used with the *short paths* feature. If not specified, the packages marked as *short_paths* will be stored in the `C:\.conan` (or the current drive letter).

If the variable is set to "None" will disable the *short_paths* feature in Windows, for modern Windows that enable long paths at the system level.

The `verbose_traceback` variable will print the complete traceback when an error occurs in a recipe or even in the conan code base, allowing to debug the detected error.

### Storage

The `storage.path` variable define the path where all the packages will be stored.

On Windows:

- It is recommended to assign it to some unit, e.g. map it to X: in order to avoid hitting the 260 chars path name length limit).
- Also see the *short_paths docs* to know more about how to mitigate the limitation of 260 chars path name length limit.
- It is recommended to disable the Windows indexer or exclude the storage path to avoid problems (busy resources).

**Note:** If you want to change the default "conan home" (directory where `conan.conf` file is) you can adjust the environment variable `CONAN_USER_HOME`.

### Proxies

If you are not using proxies at all, or you want to use the proxies specified by the operating system, just remove the `[proxies]` section completely. You can run **`conan config rm proxies`**.

If you leave the `[proxies]` section blank, conan will copy the system configured proxies, but if you configured some exclusion rule it won't work:

```
[proxies]
# Empty section will try to use system proxies.
# If you don't want Conan to mess with proxies at all, remove section [proxies]
```

You can specify http and https proxies as follows. Use the *no_proxy_match* keyword to specify a list of URLs or patterns that will skip the proxy:

```
[proxies]
# As documented in http://docs.python-requests.org/en/latest/user/advanced/#proxies
http: http://user:pass@10.10.1.10:3128/
http: http://10.10.1.10:3128
https: http://10.10.1.10:1080
no_proxy_match: http://url1, http://url2, https://url3*, https://*.custom_domain.*
```

Use *http=None* and/or *https=None* to disable the usage of a proxy.

If this fails, you might also try to set environment variables:

```
# linux/osx
$ export HTTP_PROXY="http://10.10.1.10:3128"
$ export HTTPS_PROXY="http://10.10.1.10:1080"

# with user/password
$ export HTTP_PROXY="http://user:pass@10.10.1.10:3128/"
$ export HTTPS_PROXY="http://user:pass@10.10.1.10:3128/"

# windows (note, no quotes here)
$ set HTTP_PROXY=http://10.10.1.10:3128
$ set HTTPS_PROXY=http://10.10.1.10:1080
```

## 14.8.2 profiles/default

This is the typical *~/.conan/profiles/default* file:

```
[build_requires]
[settings]
    os=Macos
    arch=x86_64
    compiler=apple-clang
    compiler.version=8.1
    compiler.libcxx=libc++
    build_type=Release
[options]
[env]
```

The settings defaults are the setting values used whenever you issue a **conan install** command over a *conanfile* in one of your projects. The initial values for these default settings are auto-detected the first time you run a **conan** command.

You can override the default settings using the **-s** parameter in **conan install** and **conan info** commands but when you specify a profile, **conan install --profile gcc48**, the default profile won't be applied, unless you specify it with an `include()` statement:

Listing 11: my_clang_profile

```
include(default)

[settings]
compiler=clang
compiler.version=3.5
compiler.libcxx=libstdc++11

[env]
CC=/usr/bin/clang
CXX=/usr/bin/clang++
```

**Tip:** Default profile can be overridden using the environment variable `CONAN_DEFAULT_PROFILE_PATH`.

**See also:**

Check the section *Profiles* to read more about this feature.

### 14.8.3 settings.yml

The `settings` are predefined, so only a few, like "os" or "compiler", are possible. They are defined in your `~/.conan/settings.yml` file. Also, the possible values they can take are restricted in the same file. This is done to ensure matching naming and spelling between users, and settings that commonly make sense to most users. Anyway, you can add/remove/modify those settings and their possible values in the `settings.yml` file, according to your needs, just be sure to share changes with colleagues or consumers of your packages.

If you want to distribute a unified `settings.yml` file you can use the *conan config install command*.

**Note:** The `settings.yml` file is not perfect nor definitive, surely incomplete. Please send us any suggestion (or better yet, a PR) with settings and values that could make sense for other users.

### 14.8.4 registry.txt

This file is generally automatically managed, and it has also access via the **conan remote** command but just in case you might need to change it. It contains information about the known remotes and from which remotes are each package retrieved:

```
conan-center https://conan.bintray.com True
local http://localhost:9300 True

Hello/0.1@demo/testing local
```

The first section of the file is listing `remote-name: remote-url verify_ssl`. Adding, removing or changing those lines, will add, remove or change the respective remote. If verify_ssl, conan client will verify the SSL certificates for that remote server.

The second part of the file contains a list of conan-package-reference: remote-name. This is a reference to which remote was that package retrieved from, which will act also as the default for operations on that package.

Be careful when modifying the remotes, as the information of the packages has to remain consistent, e.g. if removing a remote, all package references referencing that remote has to be removed too.

### 14.8.5 client.crt / client.key

Conan support client TLS certificates. Create a `client.crt` with the client certificate in the conan home directory (default ~/.conan) and a `client.key` with the private key.

You could also create only the `client.crt` file containing both the certificate and the private key concatenated.

### 14.8.6 artifacts.properties

This file is used to send custom headers in the PUT requests that **conan upload** command does:

**.conan/artifacts.properties**

```
custom_header1=Value1
custom_header2=45
```

Artifactory users can use this file to set file properties for the uploaded files. The variables should have the prefix `artifact_property`. You can use `;` to set multiple values to a property:

**.conan/artifacts.properties**

```
artifact_property_build.name=Build1
artifact_property_build.number=23
artifact_property_build.timestamp=1487676992
artifact_property_custom_multiple_var=one;two;three;four
```

## 14.9 Environment variables

These are the environment variables used to customize Conan.

> Most of them can be set in the *conan.conf* configuration file (inside your `<userhome>/.conan` folder). However, this environment variables will take precedence over the *conan.conf* configuration.

### 14.9.1 CMAKE RELATED VARIABLES

There are some Conan environment variables that will set the equivalent CMake variable using the *cmake generator* and the *CMake build tool*:

| Variable | CMake set variable |
|---|---|
| CONAN_CMAKE_TOOLCHAIN_FILE | CMAKE_TOOLCHAIN_FILE |
| CONAN_CMAKE_SYSTEM_NAME | CMAKE_SYSTEM_NAME |
| CONAN_CMAKE_SYSTEM_VERSION | CMAKE_SYSTEM_VERSION |
| CONAN_CMAKE_SYSTEM_PROCESSOR | CMAKE_SYSTEM_PROCESSOR |
| CONAN_CMAKE_FIND_ROOT_PATH | CMAKE_FIND_ROOT_PATH |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_PROGRAM | CMAKE_FIND_ROOT_PATH_MODE_PROGRAM |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_LIBRARY | CMAKE_FIND_ROOT_PATH_MODE_LIBRARY |
| CONAN_CMAKE_FIND_ROOT_PATH_MODE_INCLUDE | CMAKE_FIND_ROOT_PATH_MODE_INCLUDE |

**See also:**

See CMake cross building wiki

### 14.9.2 CONAN_BASH_PATH

**Defaulted to**: Not defined

Used only in windows to help the *tools.run_in_windows_bash()* function to locate our Cygwin/MSYS2 bash. Set it with the bash executable path if it's not in the `PATH` or you want to use a different one.

### 14.9.3 CONAN_CMAKE_GENERATOR

Conan `CMake` helper class is just a convenience to help to translate conan settings and options into cmake parameters, but you can easily do it yourself, or adapt it.

For some compiler configurations, as `gcc` it will use by default the `Unix Makefiles` cmake generator. Note that this is not a package settings, building it with makefiles or other build system, as Ninja, should lead to the same binary if using appropriately the same underlying compiler settings. So it doesn't make sense to provide a setting or option for this.

So it can be set with the environment variable `CONAN_CMAKE_GENERATOR`. Just set its value to your desired cmake generator (as `Ninja`).

### 14.9.4 CONAN_COLOR_DARK

**Defaulted to**: `False/0`

Set it to `True/1` to use dark colors in the terminal output, instead of light ones. Useful for terminal or consoles with light colors as white, so text is rendered in Blue, Black, Magenta, instead of Yellow, Cyan, White.

### 14.9.5 CONAN_COLOR_DISPLAY

**Defaulted to**: Not defined

By default if undefined conan output will use color if a tty is detected.

Set it to `False/0` to remove console output colors. Set it to `True/1` to force console output colors.

### 14.9.6 CONAN_COMPRESSION_LEVEL

**Defaulted to**: `9`

Conan uses `tgz` compression for archives before uploading them to remotes. The default compression level is good and fast enough for most cases, but users with huge packages might want to change it and set `CONAN_COMPRESSION_LEVEL` environment variable to a lower number, which is able to get slightly bigger archives but much better compression speed.

### 14.9.7 CONAN_CPU_COUNT

**Defaulted to**: Number of available cores in your machine.

Set the number of cores that the *tools.cpu_count()* will return. Conan recipes can use the cpu_count() tool to build the library using more than one core.

### 14.9.8 CONAN_DEFAULT_PROFILE_PATH

**Defaulted to**: Not defined

This variable can be used to define a path to an existing profile file that Conan will use as default. If relative, the path will be resolved from the profiles folder.

### 14.9.9 CONAN_NON_INTERACTIVE

**Defaulted to**: `False`/`0`

This environment variable, if set to `True`/`1`, will prevent interactive prompts. Invocations of Conan commands where an interactive prompt would otherwise appear, will fail instead.

This variable can also be set in `conan.conf` as `non_interactive = True` in the `[general]` section.

### 14.9.10 CONAN_ENV_XXXX_YYYY

You can override the default settings (located in your `~/.conan/profiles/default` directory) with environment variables.

The `XXXX` is the setting name upper-case, and the `YYYY` (optional) is the sub-setting name.

**Examples**:

- Override the default compiler:

```
CONAN_ENV_COMPILER = "Visual Studio"
```

- Override the default compiler version:

```
CONAN_ENV_COMPILER_VERSION = "14"
```

- Override the architecture:

```
CONAN_ENV_ARCH = "x86"
```

### 14.9.11 CONAN_LOG_RUN_TO_FILE

**Defaulted to**: `0`

If set to `1` will log every `self.run("{Some command}")` command output in a file called `conan_run.log`. That file will be located in the current execution directory, so if we call `self.run` in the conanfile.py's build method, the file will be located in the build folder.

In case we execute `self.run` in our `source()` method, the `conan_run.log` will be created in the source directory, but then conan will copy it to the `build` folder following the regular execution flow. So the `conan_run.log` will contain all the logs from your conanfile.py command executions.

The file can be included in the conan package (for debugging purposes) using the `package` method.

```
def package(self):
    self.copy(pattern="conan_run.log", dst="", keep_path=False)
```

### 14.9.12 CONAN_LOG_RUN_TO_OUTPUT

**Defaulted to**: `1`

If set to `0` conan won't print the command output to the stdout. Can be used with `CONAN_LOG_RUN_TO_FILE` set to `1` to log only to file and not printing the output.

### 14.9.13 CONAN_LOGGING_LEVEL

**Defaulted to**: `50`

By default conan logging level is only set for critical events. If you want to show more detailed logging information, set this variable to lower values, as `10` to show debug information.

### 14.9.14 CONAN_LOGIN_USERNAME, CONAN_LOGIN_USERNAME_{REMOTE_NAME}

**Defaulted to**: Not defined

You can define the username for the authentication process using environment variables. Conan will use a variable **CONAN_LOGIN_USERNAME_{REMOTE_NAME}**, if the variable is not declared Conan will use the variable **CONAN_LOGIN_USERNAME**, if the variable is not declared either, Conan will request to the user to input a username.

These variables are useful for unattended executions like CI servers or automated tasks.

If the remote name contains "-" you have to replace it with "_" in the variable name:

For example: For a remote named "conan-center":

```
SET CONAN_LOGIN_USERNAME_CONAN_CENTER=MyUser
```

### 14.9.15 CONAN_MAKE_PROGRAM

**Defaulted to**: Not defined

Specify an alternative `make` program to use with:

- The build helper *AutoToolsBuildEnvironment*. Will invoke the specified executable in the *make* method.

- The build helper *build helper CMake*. By adjusting the CMake variable CMAKE_MAKE_PROGRAM.

For example:

```
CONAN_MAKE_PROGRAM="/path/to/mingw32-make"

# Or only the exe name if it is in the path

CONAN_MAKE_PROGRAM="mingw32-make"
```

### 14.9.16 CONAN_PASSWORD, CONAN_PASSWORD_{REMOTE_NAME}

**Defaulted to**: Not defined

You can define the authentication password using environment variables. Conan will use a variable **CONAN_PASSWORD_{REMOTE_NAME}**, if the variable is not declared Conan will use the variable **CONAN_PASSWORD**, if the variable is not declared either, Conan will request to the user to input a password.

These variables are useful for unattended executions like CI servers or automated tasks.

The remote name is transformed to all uppercase. If the remote name contains "-", you have to replace it with "_" in the variable name.

For example, for a remote named "conan-center":

```
SET CONAN_PASSWORD_CONAN_CENTER=Mypassword
```

### 14.9.17 CONAN_HOOKS

**Defaulted to**: Not defined

Can be set to a comma separated list with the names of the hooks that will be executed when running a Conan command.

### 14.9.18 CONAN_PRINT_RUN_COMMANDS

**Defaulted to**: `0`

If set to `1`, every `self.run("{Some command}")` call will log the executed command {Some command} to the output.

For example: In the *conanfile.py* file:

```
self.run("cd %s && %s ./configure" % (self.ZIP_FOLDER_NAME, env_line))
```

Will print to the output (stout and/or file):

```
----Running------
> cd zlib-1.2.9 && env LIBS="" LDFLAGS=" -m64   $LDFLAGS" CFLAGS="-mstackrealign -
↪fPIC $CFLAGS -m64  -s -DNDEBUG  " CPPFLAGS="$CPPFLAGS -m64  -s -DNDEBUG  " C_
↪INCLUDE_PATH=$C_INCLUDE_PATH: CPLUS_INCLUDE_PATH=$CPLUS_INCLUDE_PATH: ./configure
-----------------
...
```

### 14.9.19 CONAN_READ_ONLY_CACHE

**Defaulted to**: Not defined

This environment variable if defined, will make the conan cache read-only. This could prevent developers to accidentally edit some header of their dependencies while navigating code in their IDEs.

This variable can also be set in `conan.conf` as `read_only_cache = True` in the `[general]` section.

The packages are made read-only in two points: when a package is built from sources, and when a package is retrieved from a remote repository.

The packages are not modified for upload, so users should take that into consideration before uploading packages, as they will be read-only and that could have other side-effects.

> **Warning:** It is not recommended to upload packages directly from developers machines with read-only mode as it could lead to inconsistencies. For better reproducibility we recommend that packages are created and uploaded by CI machines.

### 14.9.20 CONAN_RUN_TESTS

**Defaulted to**: Not defined (True/False if defined)

This environment variable (if defined) can be used in `conanfile.py` to enable/disable the tests for a library or application.

It can be used as a convention variable and it's specially useful if a library has unit tests and you are doing *cross building*, the target binary can't be executed in current host machine building the package.

It can be defined in your profile files at `~/.conan/profiles`

```
...
[env]
CONAN_RUN_TESTS=False
```

or declared in command line when invoking **`conan install`** to reduce the variable scope for conan execution

```
$ conan install . -e CONAN_RUN_TEST=0
```

See how to retrieve the value with *tools.get_env()* and check a use case with *a header only with unit tests recipe* while cross building.

See example of build method in `conanfile.py` to enable/disable running tests with CMake:

```
from conans import ConanFile, CMake, tools

class HelloConan(ConanFile):
    name = "Hello"
    version = "0.1"

    def build(self):
        cmake = CMake(self)
        cmake.configure()
        cmake.build()
        if tools.get_env("CONAN_RUN_TESTS", True):
            cmake.test()
```

### 14.9.21 CONAN_SKIP_VS_PROJECTS_UPGRADE

**Defaulted to**: `False`/`0`

When set to `True`/`1`, the *build_sln_command*, the *msvc_build_command* and the *MSBuild()* build helper, will not call `devenv` command to upgrade the `sln` project, irrespective of the `upgrade_project` parameter value.

### 14.9.22 CONAN_SYSREQUIRES_MODE

**Defaulted to**: `enabled` allowed values `enabled`/`verify`/`disabled`

This environment variable controls whether system packages should be installed into the system via `SystemPackageTool` helper, typically used in *system_requirements()*.

See values behavior:

- `enabled`: Default value and any call to install method of `SystemPackageTool` helper should modify the system packages.
- `verify`: Display a report of system packages to be installed and abort with exception. Useful if you don't want to allow conan to modify your system but you want to get a report of packages to be installed.
- `disabled`: Display a report of system packages that should be installed but continue the conan execution and doesn't install any package in your system. Useful if you want to keep manual control of these dependencies, for example in your development environment.

### 14.9.23 CONAN_SYSREQUIRES_SUDO

**Defaulted to**: `True`/`1`

This environment variable controls whether `sudo` is used for installing apt, yum, etc. system packages via `SystemPackageTool` helper, typically used in `system_requirements()`. By default when the environment variable does not exist, "True" is assumed, and `sudo` is automatically prefixed in front of package management commands. If you set this to "False" or "0" `sudo` will not be prefixed in front of the commands, however installation or updates of some packages may fail due to a lack of privilege, depending on the user account Conan is running under.

### 14.9.24 CONAN_TEMP_TEST_FOLDER

**Defaulted to**: `False`/`0`

Activating this variable will make build folder of *test_package* to be created in the temporary folder of your machine.

### 14.9.25 CONAN_TRACE_FILE

**Defaulted to**: Not defined

If you want extra logging information about your conan command executions, you can enable it by setting the `CONAN_TRACE_FILE` environment variable. Set it with an absolute path to a file.

```
export CONAN_TRACE_FILE=/tmp/conan_trace.log
```

When the conan command is executed, some traces will be appended to the specified file. Each line contains a JSON object. The `_action` field contains the action type, like `COMMAND` for command executions, `EXCEPTION` for errors and `REST_API_CALL` for HTTP calls to a remote.

The logger will append the traces until the `CONAN_TRACE_FILE` variable is unset or pointed to a different file.

**See also:**

Read more here: *How to log and debug a conan execution*

### 14.9.26 CONAN_USER, CONAN_CHANNEL

Environment variables commonly used in `test_package` conanfiles, to allow package creation for different users and channel without modifying the code. They are also the environment variables that will be checked when using `self.user` or `self.channel` in `conanfile.py` package recipes in user space, where a user/channel has not been assigned yet (it is assigned when exported in the local cache).

**See also:**

Read more about it in *user, channel*

### 14.9.27 CONAN_USER_HOME

**Defaulted to**: Not defined

Allows defining a custom conan cache directory. Can be useful for concurrent builds under different users in CI, to retrieve and store per-project specific dependencies (useful for deployment, for example).

**See also:**

Read more about it in *Conan local cache: concurrency, Continuous Integration, isolation*

### 14.9.28 CONAN_USER_HOME_SHORT

**Defaulted to**: Not defined

Specify the base folder to be used with the *short paths* feature. When not specified, the packages marked as *short_paths* will be stored in the `C:\.conan` (or the current drive letter).

If set to `None`, it will disable the *short_paths* feature in Windows for modern Windows that enable long paths at the system level.

### 14.9.29 CONAN_USE_ALWAYS_SHORT_PATHS

**Defaulted to**: Not defined

If defined to `True` or `1`, every package will be stored in the *short paths directory* resolved by Conan after evaluating `CONAN_USER_HOME_SHORT` variable (see above). This variable, therefore, overrides the value defined in recipes for the attribute *short paths*.

### 14.9.30 CONAN_VERBOSE_TRACEBACK

**Defaulted to**: `0`

When an error is raised in a recipe or even in the conan code base, if set to `1` it will show the complete traceback to ease the debugging.

### 14.9.31 CONAN_VS_INSTALLATION_PREFERENCE

**Defaulted to**: `Enterprise, Professional, Community, BuildTools`

This environment variables defines the order of preference when searching for a Visual installation product. This would affect every tool that uses `tools.vs_installation_path()` and will search in the order indicated.

For example:

```
set CONAN_VS_INSTALLATION_PREFERENCE=Enterprise, Professional, Community, BuildTools
```

It can also be used to fix the type of installation you want to use indicating just one product type:

```
set CONAN_VS_INSTALLATION_PREFERENCE=BuildTools
```

## 14.10 Hooks [EXPERIMENTAL]

**Warning:** This is an **experimental** feature subject to breaking changes in future releases.

The Conan hooks are Python functions that are intended to extend the Conan functionalities and let users customize the client behavior at determined execution points.

### 14.10.1 Hook interface

Here you can see a complete example of all the hook functions available and the different parameters for each of them depending on the context:

```
def pre_export(output, conanfile, conanfile_path, reference, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))

def post_export(output, conanfile, conanfile_path, reference, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))

def pre_source(output, conanfile, conanfile_path, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    if conanfile.in_local_cache:
        output.info("reference=%s" % str(kwargs["reference"]))

def post_source(output, conanfile, conanfile_path, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    if conanfile.in_local_cache:
        output.info("reference=%s" % str(kwargs["reference"]))

def pre_build(output, conanfile, **kwargs):
    assert conanfile
    if conanfile.in_local_cache:
```

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```
        output.info("reference=%s" % str(kwargs["reference"]))
        output.info("package_id=%s" % kwargs["package_id"])
    else:
        output.info("conanfile_path=%s" % kwargs["conanfile_path"])

def post_build(output, conanfile, **kwargs):
    assert conanfile
    if conanfile.in_local_cache:
        output.info("reference=%s" % str(kwargs["reference"]))
        output.info("package_id=%s" % kwargs["package_id"])
    else:
        output.info("conanfile_path=%s" % kwargs["conanfile_path"])

def pre_package(output, conanfile, conanfile_path, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    if conanfile.in_local_cache:
        output.info("reference=%s" % str(kwargs["reference"]))
        output.info("package_id=%s" % kwargs["package_id"])

def post_package(output, conanfile, conanfile_path, **kwargs):
    assert conanfile
    output.info("conanfile_path=%s" % conanfile_path)
    if conanfile.in_local_cache:
        output.info("reference=%s" % str(kwargs["reference"]))
        output.info("package_id=%s" % kwargs["package_id"])

def pre_upload(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def post_upload(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def pre_upload_recipe(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def post_upload_recipe(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def pre_upload_package(output, conanfile_path, reference, package_id, remote,␣
↪**kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("package_id=%s" % package_id)
    output.info("remote.name=%s" % remote.name)

def post_upload_package(output, conanfile_path, reference, package_id, remote,␣
↪**kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
```

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```
    output.info("reference=%s" % str(reference))
    output.info("package_id=%s" % package_id)
    output.info("remote.name=%s" % remote.name)

def pre_download(output, reference, remote, **kwargs):
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def post_download(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def pre_download_recipe(output, reference, remote, **kwargs):
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def post_download_recipe(output, conanfile_path, reference, remote, **kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("remote.name=%s" % remote.name)

def pre_download_package(output, conanfile_path, reference, package_id, remote,␣
↪**kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("package_id=%s" % package_id)
    output.info("remote.name=%s" % remote.name)

def post_download_package(output, conanfile_path, reference, package_id, remote,␣
↪**kwargs):
    output.info("conanfile_path=%s" % conanfile_path)
    output.info("reference=%s" % str(reference))
    output.info("package_id=%s" % package_id)
    output.info("remote.name=%s" % remote.name)
```

Functions of the hooks are intended to be self-descriptive regarding to the execution of them. For example, the `pre_package()` function is called just before the `package()` method of the recipe is executed.

For download/upload functions, the `pre_download()`/`pre_upload()` function is executed first in an **`conan download`**/**`conan upload`** command. Then **pre** and **post** `download_recipe()`/`upload_recipe()` and its subsequent **pre/post** `download_package()`/`upload_package()` if that is the case. Finally the general `post_download()`/`post_upload()` function is called to wrap up the whole execution.

---

**Important:** **Pre** and **post** `download_recipe()`/`download_package()` are also executed when installing new recipes/packages from remotes using **`conan create`** or **`conan install`**.

---

### 14.10.2 Function parameters

Here you can find the description for each parameter:

- **output**: *Output object* to print formatted messages during execution with the name of the hook and the function executed, e.g., `[HOOK - complete_hook] post_download_package(): This is the remote name: default`.

- **conanfile**: It is a regular `ConanFile` object loaded from the recipe that received the Conan command. It has its normal attributes and dynamic objects such as `build_folder`, `package_folder`...
- **conanfile_path**: Path to the *conanfile.py* file whether it is in local cache or in user space.
- **reference**: Named tuple with attributes `name`, `version`, `user`, and `channel`. Its representation will be a reference like: `box2d/2.1.0@user/channel`
- **package_id**: String with the computed package ID.
- **remote**: Named tuple with attributes `name`, `url` and `verify_ssl`.

| Availability of parameters for each Hook function depending on the context | | **Hook Functions*** | | | | | |
|---|---|---|---|---|---|---|---|
| | | `export()` | `source()` | `build()` | `package()` | `upload()` `upload_recipe()` `upload_package()` | `download()` `pre_download_recipe()` `download_package()` |
| **Parameters** | `conanfile` | Yes | Yes | Yes | Yes | No | post |
| | `conanfile_path` | pre / post | Yes | user space | pre / post | Yes | post |
| | `reference` | Yes | cache | cache | cache | Yes | Yes |
| | `package_id` | No | No | cache | Yes | Yes | Yes |
| | `remote` | No | No | No | No | Yes | Yes |

*Hook functions are indicated without `pre` and `post` prefixes for simplicity.

**Table legend:**

- **Yes**: Availability in `pre` and `post` functions in any context.
- **No**: Not available.
- **pre / post**: Availability in both `pre` and `post` functions with **different values**. e.g. `conanfile_path` pointing to user space in `pre` and to local cache in `post`.
- **post**: Only available in `post` function.
- **cache**: Only available when the context of the command executed is the local cache. e.g. **`conan create`**, **`conan install`**...
- **user space**: Only available when the context of the command executed is the user space. e.g. **`conan build`**

**Note:** Path to the different folders of the Conan execution flow may be accessible as usual through the `conanfile` object. See *folders* to learn more.

Some of this parameters does not appear in the signature of the function as they may not be always available (Mostly depending on the recipe living in the local cache or in user space). However, they can be checked with the `kwargs` parameter.

**Important:** Hook functions should have a `**kwargs` parameter to keep compatibility of new parameters that may be introduced in future versions of Conan.

CHAPTER

FIFTEEN

# VIDEOS AND LINKS

- CppCon 2018: “Git, CMake, Conan - How to ship and reuse our C++ projects” by Mateusz Pusz.
- JFrog swampUP 2018: “Managing dependencies and toolchains with Conan and Artifactory” by Tobias Hieta
- JFrog swampUP 2018: “Cross building… It’s almost too easy!” by Théo Delrieu.
- JFrog Conan Playlist: “Conan - The C/C++ Package Manager”
- FOSDEM 2018: “Packaging C/C++ libraries with Conan” by Théo Delrieu.

  Includes AndroidNDK package and cross build to Android
- CppCon 2016: “Introduction to Conan C/C++ Package Manager” by Diego Rodriguez-Losada.
- CppCon 2017: “Faster Delivery of Large C/C++ Projects with Conan Package Manager and Efficient Continuous Integration” by Diego Rodriguez-Losada.
- “Conan.io C++ Package Manager demo with SFML” by Charl Botha

Do you have a video, tutorial, blog post that could be useful for other users and would like to share? Please tell us about it or directly send a PR to our docs: https://github.com/conan-io/docs, and we will link it here.

CHAPTER

SIXTEEN

# FAQ

**See also:**

There is a great community behind Conan with users helping each other in Cpplang Slack. Please join us in the `#conan` channel!

## 16.1 Upgrading to conan 1.0

If you have been using a 0.X version of Conan, there are some things to consider when upgrading to version 1.0. These are reflected in the *changelog*., however, this section summarizes the most important ones:

### 16.1.1 Command line changes

There are quite a few things that will break existing usage (compared to 0.30). Most of these are in command line arguments, so they are relatively easy to fix. The most important one is that now, most commands require the path to the conanfile folder or file, instead of using `--path` and `--file` arguments. Specifically, **`conan install`**, **`conan export`** and **`conan create`** are the ones most affected:

```
# instead of --path=myfolder --file=myconanfile.py, now you can do:
$ conan install . # Note the "." is now mandatory
$ conan install folder/myconanfile.txt
$ conan install ../myconanfile.py
$ conan info .
$ conan create . user/channel
$ conan create . Pkg/0.1@user/channel
$ conan create mypkgconanfile.py Pkg/0.1@user/channel
$ conan export . user/channel
$ conan export . Pkg/0.1@user/channel
$ conan export myfolder/myconanfile.py Pkg/0.1@user/channel
```

This behavior aligns with the **`conan source`**, **`conan build`** and **`conan package`** commands, that all use the same arguments to locate the *conanfile.py* containing the logic to be run.

Now all commands read: **`command <origin-conanfile> ...`**

Also, all arguments to the command line now use a dash instead of an underscore:

```
$ conan build .. --source-folder=../src  # not --source_folder
```

### 16.1.2 Deprecations/removals

- scopes were completely removed in conan 0.30.X
- `self.conanfile_directory` has been removed. Use `self.source_folder`, `self.build_folder`, etc. instead
- `self.cpp_info`, `self.env_info` and `self.user_info` scope has been reduced to only the `package_info()` method
- `gcc` and `ConfigureEnvironment` were already removed in conan 0.30.1
- `werror` doesn't exist anymore. It is now built-in behavior.
- Command `test_package` has been removed. Use **`conan create`** and **`conan test`** instead.
- `CMake` helper now (from conan 0.29) only allows the `CMake(self)` syntax
- **`conan package_files`** command was replaced in conan 0.28 by **`conan export-pkg`** command.

### 16.1.3 Settings and profiles. GCC/Clang versioning

GCC and Clang compilers have modified their versioning approach, from GCC > 5 and Clang > 4. The minor versions are really bugfixes, and then they have binary compatibility. To adapt to this, conan now includes the major version in the *settings.yml* default settings file:

```
gcc:
    version: ["4.1", "4.4", "4.5", "4.6", "4.7", "4.8", "4.9",
              "5", "5.1", "5.2", "5.3", "5.4",
              "6", "6.1", "6.2", "6.3", "6.4",
              "7", "7.1", "7.2"]
```

Most package creators want to use the major-only settings, such as `-s compiler=gcc -s compiler.version=5`, instead of also specifying the minor versions.

The default profile detection and creation has been modified accordingly, but if you have a default profile, you may want to update it to reflect this:

Conan-associated tools (conan-package-tools, conan.cmake) have been upgraded to accommodate these new defaults.

### 16.1.4 New features

- Cross-compilation support with new default settings in settings.yml: `os_build`, `arch_build`, `os_target`, `arch_target`. They are automatically removed from the `package_id` computation, or kept if they are the only ones defined (as usually happens with dev-tools packages). It is also possible to keep them with the `self.info.include_build_settings()` method (call it from your `package_id()` method).

---

**Important:** Please **don't** use cross-build settings `os_build`, `arch_build` for standard packages and libraries. They are only useful for packages that are used via `build_requires`, like `cmake_installer` or `mingw_installer`.

---

- Model and utilities for Windows subsystems

```
os:
    Windows:
        subsystem: [None, cygwin, msys, msys2, wsl]
```

This subsetting can be used by build helpers such as `CMake` to act accordingly.

## 16.2 General

### 16.2.1 Is Conan CMake based, or is CMake a requirement?

No. It isn't. Conan is build-system agnostic. Package creators could very well use cmake to create their packages, but you will only need it if you want to build packages from source, or if there are no available precompiled packages for your system/settings. We use CMake extensively in our examples and documentation, but only because it is very convenient and most C/C++ devs are familiar with it.

### 16.2.2 Is build-system XXXXX supported?

Yes. It is. Conan makes no assumption about the build system. It just wraps any build commands specified by the package creators. There are already some helper methods in code to ease the use of CMake, but similar functions can be very easily added for your favorite build system. Please check out the alternatives explained in *generator packages*

### 16.2.3 Is my compiler, version, architecture, or setting supported?

Yes. Conan is very general, and does not restrict any configuration at all. However, conan comes with some compilers, versions, architectures, ..., etc. pre-configured in the `~/.conan/settings.yml` file, and you can get an error if using settings not present in that file. Go to *invalid settings* to learn more about it.

### 16.2.4 Does it run offline?

Yes. It runs offline very well. Package recipes and binary packages are stored in your machine, per user, and so you can start new projects that depend on the same libraries without any Internet connection at all. Packages can be fully created, tested and consumed locally, without needing to upload them anywhere.

### 16.2.5 Is it possible to install 2 different versions of the same library?

Yes. You can install as many different versions of the same library as you need, and easily switch among them in the same project, or have different projects use different versions simultaneously, and without having to install/uninstall or re-build any of them.

Package binaries are stored per user in (e.g.) `~/.conan/data/Boost/1.59/user/stable/package/{sha_0, sha_1, sha_2...}` with a different SHA signature for every different configuration (debug, release, 32-bit, 64-bit, compiler...). Packages are managed per user, but additionally differentiated by version and channel, and also by their configuration. So large packages, like Boost, don't have to be compiled or downloaded for every project.

### 16.2.6 Can I run multiple conan isolated instances (virtual environments) on the same machine?

Yes, conan supports the concept of virtual environments; so it manages all the information (packages, remotes, user credentials, ..., etc.) in different, isolated environments. Check *virtual environments* for more details.

### 16.2.7 Can I run the conan_server behind a firewall (on-premises)?

Yes. Conan does not require a connection to conan.io site or any other external service at all for its operation. You can install packages from the bintray conan-center repository if you want, test them, and only after approval, upload them to your on-premises server and forget about the original repository. Or you can just get the package recipes, re-build from source on your premises, and then upload the packages to your server.

### 16.2.8 Can I connect to conan remote servers through a corporate proxy?

Yes, it can be configured in your **~/.conan/conan.conf** configuration file or with some environment variables. Check *proxy configuration* for more details.

### 16.2.9 Can I create packages for third-party libraries?

Of course, as long as their license allows it.

### 16.2.10 Can I upload closed source libraries?

Yes. As long as the resulting binary artifact can be distributed freely and free of charge, at least for educational and research purposes, and as long as you comply with all licenses and IP rights of the original authors, as well as the Terms of Service. If you want to distribute your libraries only for your paying customers, please contact us.

### 16.2.11 Do I always need to specify how to build the package from source?

No. But it is highly recommended. If you want, you can just directly start with the binaries, build elsewhere, and upload them directly. Maybe your `build()` step can download pre-compiled binaries from another source and unzip them, instead of actually compiling from sources.

### 16.2.12 Does conan use semantic versioning (semver) for dependencies?

It uses a convention by which package dependencies follow semver by default; thus it intelligently avoids recompilation/repackaging if you update upstream minor versions, but will correctly do so if you update major versions upstream. This behavior can be easily configured and changed in the `package_id()` method of your conanfile, and any versioning scheme you desire is supported.

## 16.3 Using conan

### 16.3.1 How to package header-only libraries?

Packaging header-only libraries is similar to other packages, make sure to first read and understand the *packaging getting started guide*. The main difference is that the package recipe is typically much simpler. There are different

approaches depending if you want Conan to run the library unit tests while creating the package or not. Full details *in this how-to*.

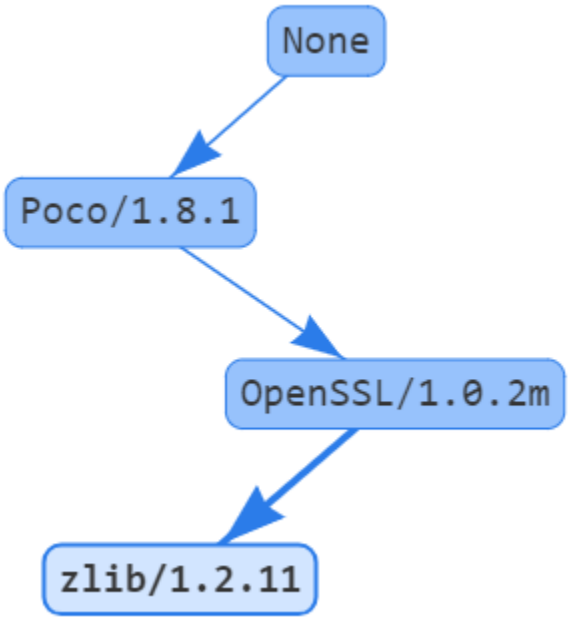
### 16.3.2 When to use settings or options?

While creating a package you might want to add different configurations and variants of the package. There are 2 main inputs that define packages: settings and options. Read about them in *this section*

### 16.3.3 How to obtain the dependents of a given package?

The search model for Conan in commands such as **`conan install`** and **`conan info`** is done from the downstream or "consumer" package as the starting node of the dependency graph and upstream.

```
$ conan info Poco/1.8.1@pocoproject/stable
```




The inverse model (from upstream to downstream) is not simple to obtain for Conan packages, because the dependency graph is not unique: It changes for every configuration. The graph can be different for different operating systems or just by changing some package options. So you cannot query which packages are dependent on `MyLib/0.1@user/channel`, but which packages are dependent on `MyLib/0.1@user/channel:63da998e3642b50bee33` binary package, and the response can contain many different binary packages for the same recipe, like `MyDependent/0.1@user/channel:packageID1... ID2... MyDependent/0.1@user/channel:packageIDN`. That is the reason why **`conan info`** and **`conan install`** need a profile (default profile or one given with `--profile`) or installation files `conanbuildinfo.txt` to look for settings and options.

In order to show the inverse graph model, the bottom node is needed to build the graph upstream and an additional node too to get the inverse list. This is usually done to get the build order in case a package is updated. For example, if we want to know the build order of the Poco dependency graph in case OpenSSL is changed we could type:

```
$ conan info Poco/1.8.1@pocoproject/stable -bo OpenSSL/1.0.2m@conan/stable
[OpenSSL/1.0.2m@conan/stable], [Poco/1.8.1@pocoproject/stable]
```

So, if OpenSSL is changed, we would need to rebuild it (of course) and rebuild Poco.

### 16.3.4 Packages got outdated when uploading an unchanged recipe from a different machine

Usually this is caused due to different line endings in Windows and Linux/macOS. Normally this happens when Windows uploads it with CRLF while Linux/macOS do it with only LF. Conan does not change the line endings to not interfere with user. We suggest going with LF line endings always. If this is being caused by git, it could be solved with **`git config --system core.autocrlf input`**.

### 16.3.5 Is there any recommendation regarding which `<user>` or `<channel>` to use in a reference?

A Conan reference is defined by the following template: `<library-name>/<library-version>@<user>/<channel>`

The `<user>` term in a Conan reference is basically a namespace to avoid collisions of libraries with the same name and version in the local cache and in the same remote. This field is usually populated with the author's name of the package recipe (which could be different from the author of the library itself) or with the name of the organization creating it. Here are some examples from Conan Center:

```
OpenSSL/1.1.1@conan/stable
CLI11/1.6.1@cliutils/stable
CTRE/2.1@ctre/stable
Expat/2.2.5@pix4d/stable
FakeIt/2.0.5@gasuketsu/stable
Poco/1.9.0@pocoproject/stable
c-blosc/v1.14.4@francescalted/stable
```

In the case of the `<channel>` term, normally OSS package creators use `testing` when they are developing a recipe (e.g., It compiles only in few configurations) and `stable` when the recipe is ready enough to be used (e.g., It is built and tested in a wide range of configurations).

From the perspective of a library developer, channels could be used to create different scopes of your library. For example, use `rc` channel for release candidates, maybe `experimental` for those kind of features, or even `qa/testing` before the library is checked by QA department or testers.

## 16.4 Troubleshooting

### 16.4.1 ERROR: Missing prebuilt package

When you are installing packages (with **`conan install`** or **`conan create`**) it is possible that you get an error like the following one:

```
WARN: Can't find a 'libzmq/4.2.0@memsharded/testing' package for the specified␣
↪options and settings:
- Settings: arch=x86_64, build_type=Release, compiler=gcc, compiler.libcxx=libstdc++,␣
↪compiler.version=4.9, os=Windows
```

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```
- Options: shared=False
- Package ID: 7fe67dff831b24bc4a8b5db678a51f1be5e44e7c

ERROR: Missing prebuilt package for 'libzmq/4.2.0@memsharded/testing'
Try to build it from sources with "--build libzmq" or read "http://docs.conan.io/en/
↪latest/faq.html"
```

This means that the package recipe `libzmq/4.2.0@memsharded/testing` exists, but for some reason there is no precompiled package for your current settings. Maybe the package creator didn't build and shared pre-built packages at all and only uploaded the package recipe, or maybe they are only providing packages for some platforms or compilers. E.g. the package creator built packages from the recipe for gcc 4.8 and 4.9, but you are using gcc 5.4.

By default, conan doesn't build packages from sources. There are several possibilities:

- You can try to build the package for your settings from sources, indicating some build policy as argument, like `--build libzmq` or `--build missing`. If the package recipe and the source code work for your settings you will have your binaries built locally and ready for use.
- If building from sources fail, you might want to fork the original recipe, improve it until it supports your configuration, and then use it. Most likely contributing back to the original package creator is the way to go. But you can also upload your modified recipe and pre-built binaries under your own username too.

### 16.4.2 ERROR: Invalid setting

It might happen sometimes, when you specify a setting not present in the defaults that you receive a message like this:

```
$ conan install . -s compiler.version=4.19 ...

ERROR: Invalid setting '4.19' is not a valid 'settings.compiler.version' value.
Possible values are ['4.4', '4.5', '4.6', '4.7', '4.8', '4.9', '5.1', '5.2', '5.3',
↪'5.4', '6.1', '6.2']
Read "http://docs.conan.io/en/latest/faq/troubleshooting.html#error-invalid-setting"
```

This doesn't mean that such architecture is not supported by conan, it is just that it is not present in the actual defaults settings. You can find in your user home folder `~/.conan/settings.yml` a settings file that you can modify, edit, add any setting or any value, with any nesting if necessary.

As long as your team or users have the same settings (you can share with them the file), everything will work. The `settings.yml` file is just a mechanism so users agree on a common spelling for typically settings. Also, if you think that some settings would be useful for many other conan users, please submit it as an issue or a pull request, so it is included in future releases.

It is possible that some build helper, like `CMake` will not understand the new added settings, don't use them or even fail. Such helpers as `CMake` are simple utilities to translate from conan settings to the respective build system syntax and command line arguments, so they can be extended or replaced with your own one that would handle your own private settings.

### 16.4.3 ERROR: Setting value not defined

When you install or create a package, it is possible to see an error like this:

```
ERROR: Hello/0.1@user/testing: 'settings.arch' value not defined
```

This means that the recipe defined `settings = "os", "arch", ...` but a value for the `arch` setting was not provided either in a profile or in the command line. Make sure to specify a value for it in your profile, or in the command line:

```
$ conan install . -s arch=x86 ...
```

If you are building a pure C library with gcc/clang, you might encounter an error like this:

```
ERROR: Hello/0.1@user/testing: 'settings.compiler.libcxx' value not defined
```

Indeed, for building a C library, it is not necessary to define a C++ standard library. And if you provide a value, you might end with multiple packages for exactly the same binary. What has to be done is to remove such subsetting in your recipe:

```
def configure(self):
    del self.settings.compiler.libcxx
```

### 16.4.4 ERROR: Failed to create process

When conan is installed via pip/PyPI, and python is installed in a path with spaces (like many times in Windows "C:/Program Files..."), conan can fail to launch. This is a known python issue, and can't be fixed from conan. The current workarounds would be:

- Install python in a path without spaces
- Use virtualenvs. Short guide:

```
$ pip install virtualenvwrapper-win # virtualenvwrapper if not Windows
$ mkvirtualenv conan
(conan) $ pip install conan
(conan) $ conan --help
```

Then, when you will be using conan, for example in a new shell, you have to activate the virtualenv:

```
$ workon conan
(conan) $ conan --help
```

Virtualenvs are very convenient, not only for this workaround, but to keep your system clean and to avoid unwanted interaction between different tools and python projects.

### 16.4.5 ERROR: Failed to remove folder (Windows)

It is possible that operating conan, some random exceptions (some with complete tracebacks) are produced, related to the impossibility to remove one folder. Two things can happen:

- The user has some file or folder open (in a file editor, in the terminal), so it cannot be removed, and the process fails. Make sure to close files, specially if you are opening or inspecting the local conan cache.
- In Windows, the Search Indexer might be opening and locking the files, producing random, difficult to reproduce and annoying errors. Please **disable the Windows Search Indexer for the conan local storage folder**

CHAPTER

# SEVENTEEN

# CHANGELOG

Check https://github.com/conan-io/conan for issues and more details about development, contributors, etc.

**Important:** Conan 1.9 shouldn't break any existing 1.0 recipe or command line invocation. If it does, please submit a report on GitHub. Read more about the *Conan stability commitment*.

## 17.1 1.9.2 (20-Nov-2018)

- Bugfix: SVN API changes are relevant since version 1.9 #3954
- Bugfix: Fixed bug in *vcvars_dict* tool when using *filter_known_paths* argument. #3941

## 17.2 1.9.1 (08-Nov-2018)

- Fix: Fix regression introduced in 1.7, setting `amd64_x86` when no `arch_build` is defined. #3918
- Fix: Do not look for binaries in other remotes than the recipe, if it is defined. #3890
- Bugfix: `sudo --askpass` breaks CentOS 6 package installation. The sudo version on CentOS 6 is 1.8.6. The option of `askpass` for sudo version 1.8.7 or older is *sudo -A*. #3885

## 17.3 1.9.0 (30-October-2018)

- Feature: Support for `srcdirs` in `package_info()`. Packages can package sources, and specify their location, which will be propagated to consumers. Includes support for CMake generator. #3857
- Feature: Added *remote_name* and *remote_url* to upload json output. #3850
- Feature: Add environment variable *CONAN_USE_ALWAYS_SHORT_PATHS* to let the consumer override short_paths behavior from recipes #3846
- Feature: Added `--json` output to `conan export_pkg` command #3809
- Feature: Add *conan remote clean* subcommand #3767
- Feature: New *premake* generator incorporated to the Conan code base from the external generator at https://github.com/memsharded/conan-premake. #3751
- Feature: New *conan remote list_pref/add_pref/remove_pref/update_pref* commands added to manage the new Registry entries for binary packages. #3726

- Feature: Add cpp_info data to json output of `install` and `create` commands at package level. #3717
- Feature: Now the default templates of the **`conan new`** command use the docker images from the *conanio* organization: https://hub.docker.com/u/conanio #3710
- Feature: Added `topics` attribute to the *ConanFile* to specify topics (a.k.a tags, a.k.a keywords) to the recipe. #3702
- Feature: Internal refactor to the remote registry to manage a json file. Also improved internal interface. #3676
- Feature: Implement reuse of sources (`exports_sources`) in recipes used as `python_requires()`. #3661
- Feature: Added support for Clang >=8 and the new versioning schema, where only the major and the patch is used. #3643
- Fix: Renamed Plugins as Hooks #3867
- Fix: Adds GCC 8.2 to default settings.yml #3865
- Fix: Hidden confusing messages *download conaninfo.txt* when requesting the server to check package manifests. #3861
- Fix: The `MSBuild()` build helper doesn't adjust the compiler flags for the build_type anymore because they are adjusted by the project itself. #3860
- Fix: Add `neon` as linux distro for SystemPackageTools #3845
- Fix: remove error that was raised for custom compiler & compiler version, while checking `cppstd` setting. #3844
- Fix: do not allow wildcards in command `conan download <ref-without-wildcards>` #3843
- Fix: do not populate `arch` nor `arch_build` in autodetected profile if `platform.machine` returns an empty string. #3841
- Fix: The registry won't remove a reference to a remote removed recipe or package. #3838
- Fix: Internal improvements of the ConanFile loader #3837
- Fix: environment variables are passed verbatim to generators. #3836
- Fix: Implement dirty checks in the cache build folder, so failed builds are not packaged when there is a `build_id()` method. #3834
- Fix: `vcvars` is also called in the `CMake()` build helper when *clang* compiler is used, not only with Visual Studio'compiler. '#3832
- Fix: Ignore empty line when parsing output inside `SVN::excluded_files` function. #3830
- Fix: Bump version of `tqdm` requirement to `>=4.28.0` #3823
- Fix: Handling corrupted lock files in cache #3816
- Fix: Implement download concurrency checks, to allow simultaneous download of the same package (as header-only) while installing different configurations that depend on that package. #3806
- Fix: `vcvars` is also called in the *CMake()* build helper when using *Ninja* or *NMake* generators. #3803
- Fix: Fixed `link_flags` management in `MSBuild` build helper #3791
- Fix: Allow providing `--profile` argument (and settings, options, env, too) to **`conan export-pkg`**, so it is able to correctly compute the binary package_id in case the information captured in the installed conaninfo.txt in previous **`conan install`** does not contain all information to reconstruct the graph. #3768
- Fix: Upgrade dependency of `tqdm` to >=4.27: solves issue with weakref assertion. #3763

- Fix: Use XML output to retrieve information from SVN command line if its client version is less than 1.8 (command `--show-item` is not available). #3757
- Fix: SVN v1.7 does not have `-r` argument in `svn status`, so functionality `SVN::is_pristine` won't be available. #3757
- Fix: Add `--askpass` argument to `sudo` if it is not an interactive terminal #3727
- Fix: The remote used to download a binary package is now stored, so any update for the specific binary will come from the right remote. #3726
- Fix: Use XML output from SVN command line interface to compute if the repository is pristine. #3653
- Fix: Updated templates of the **`conan new`** command with the latest conan package tools changes. #3651
- Fix: Improve error messages if conanfile was not found #3554
- BugFix: Fix conflicting multiple local imports for python_requires #3876
- Bugfix: do not ask for the username if it is already given when login into a remote. #3839
- Bugfix: `yum update` needs user's confirmation, which breaks system update in CentOS non-interactive terminal. #3747

## 17.4 1.8.4 (19-October-2018)

- Feature: Increase debugging information when an error uploading a recipe with different timestamp occurs. #3801
- Fix: Changed `tqdm` dependency to a temporarily forked removing the "man" directory write permissions issue installing the *pip* package. #3802
- Fix: Removed *ndg-httpsclient* and *pyasn* dependencies from OSX requirements file because they shouldn't be necessary. #3802

## 17.5 1.8.3 (17-October-2018)

- Feature: New attributes `default_user` and `default_channel` that can be declared in a conanfile to specify the *user* and *channel* for conan local methods when neither *CONAN_USERNAME* and *CONAN_CHANNEL* environment variables exist. #3758
- Bugfix: AST parsing of `conanfile.py` with shebang and encoding header lines was failing in python 2. This fix also allows non-ascii chars in `conanfile.py` if proper encoding is declared. #3750

## 17.6 1.8.2 (10-October-2018)

- Fix: Fix misleading warning message in `tools.collect_libs()` #3718
- BugFix: Fixed wrong naming of `--sbindir` and `--libexecdir` in AutoTools build helper. #3715

## 17.7 1.8.1 (10-October-2018)

- Fix: Remove warnings related to `python_requires()`, both in linter and due to Python2. #3706

- Fix: Use *share* folder for `DATAROOTDIR` in CMake and AutoTools build helpers. #3705
- Fix: Disabled *apiv2* until the new protocol becomes stable. #3703

## 17.8 1.8.0 (9-October-2018)

- Feature: Allow *conan config install* to install configuration from a folder and not only from compressed files. #3680
- Feature: The environment variable CONAN_DEFAULT_PROFILE_PATH allows the user to define the path (existing) to the default profile that will be used by Conan. #3675
- Feature: New **`conan inspect`** command that provides individual attributes of a recipe, like name, version, or options. Work with `-r=remote` repos too, and is able to produce `--json` output. #3634
- Feature: Validate parameter for ConanFileReference objects to avoid unnecessary checks #3623
- Feature: The environment variable *CONAN_DEFAULT_PROFILE_PATH* allows the user to define the path (absolute and existing) to the default profile that will be used by Conan. #3615
- Feature: Warning message printed if Conan cannot deduce an architecture of a GNU triplet. #3603
- Feature: The `AutotoolsBuildEnvironment` and `CMake` build helpers now adjust default for the GNU standard installation directories: `bindir`, `sbin`, `libexec`, `includedir`, `oldincludedir`, `datarootdir` #3599
- Feature: Added `use_default_install_dirs` in `AutotoolsBuildEnvironment.configure()` to opt-out from the defaulted installation dirs. #3599
- Feature: Clean repeated entries in the `PATH` when `vcvars` is run, mitigating the max size of the env var issues. #3598
- Feature: Allow `vcvars` to run if `clang-cl` compiler is detected. #3574
- Feature: Added python 2 deprecation message in the output of the conan commands. #3567
- Feature: The **`conan install`** command now prints information about the applied configuration. #3561
- Feature: New naming convention for conanfile reserved/public/private attributes. #3560
- Feature: Experimental support for Conan plugins. #3555
- Feature: Progress bars for files unzipping. #3545
- Feature: Improved graph propagation performance from `O(n2)` to `O(n)`. #3528
- Feature: Added `ConanInvalidConfiguration` as the standard way to indicate that a specific configuration is not valid for the current package. e.g library not compatible with Windows. #3517
- Feature: Added `libtool()` function to the *tools.XCRun()* tool to locate the system `libtool`. #3515
- Feature: The tool `tools.collect_libs()` now search into each folder declared in `self.cpp_info.libdirs`. #3503
- Feature: Added definition `CMAKE_OSX_DEPLOYMENT_TARGET` to the `CMake` build helper following the `os.version` setting for `Macos`. #3486
- Feature: The upload of files now uses the *conanmanifest.txt* file to know if a file has to be uploaded or not. It avoids issues associated with the metadata of the files permissions contained in the *tgz* files. #3480
- Feature: The *default_options* in a *conanfile.py* can be specified now as a dictionary. #3477
- Feature: The command *conan config install* now support relative paths. #3468

- Feature: Added a definition *CONAN_IN_LOCAL_CACHE* to the *CMake()* build helper. #3450
- Feature: Improved *AptTool* at *SystemPackageTool* adding a function *add_repository* to add new apt repositories. #3445
- Feature: Experimental and initial support for the REST *apiv2* that will allow transfers in one step and revisions in the future. #3442
- Feature: Improve the output of a **`conan install`** command printing dependencies when a binary is not found. #3438
- Feature: New *b2* generator. It replaces the old incomplete *boost_build* generator that is now deprecated. #3416
- Feature: New `tool.replace_path_in_file` to replace Windows paths in a file doing case-insensitive comparison and indistinct path separators comparison: "/" == "" #3399
- Feature: **[Experimental]** Add SCM support for SVN. #3192
- Fix: `None` option value was not being propagated upstream in the dependency graph #3684
- Fix: Apply `system_requirements()` always on install, in case the folder was removed. #3647
- Fix: Included `bottle` package in the development requirements #3646
- Fix: More complete architecture list in the detection of the gnu triplet and the detection of the build machine architecture. #3581
- Fix: Avoid downloading the manifest of the recipe twice for uploads. Making this download quiet, without output. #3552
- Fix: Fixed `Git` scm class avoiding to replace any character in the `get_branch()` function. #3496
- Fix: Removed login username syntax checks that were no longer necessary. #3464
- Fix: Removed bad duplicated messages about dependency overriding when using conan alias. #3456
- Fix: Improve **`conan info`** help message. #3415
- Fix: The generator files are only written in disk if the content of the generated file changes. #3412
- Fix: Improved error message when parsing a bad conanfile reference. #3410
- Fix: Paths are replaced correctly on Windows when using `CMake().patch_config_files()`. #3399
- Fix: Fixed *AptTool* at *SystemPackageTool* to improve the detection of an installed package. #3033
- BugFix: Fixes `python_requires` overwritten when using more than one of them in a recipe #3628
- BugFix: Fix output overlap of decompress progress and plugins #3622
- Bugfix: Check if the `system_requirements()` have to be executed even when the package is retrieved from the local cache. #3616
- Bugfix: All API calls are now logged into the `CONAN_TRACE_FILE` log file. #3613
- Bugfix: Renamed `os` (reserved symbol) parameter to `os_` in the `get_gnu_triplet` tool. #3603
- Bugfix: **`conan get`** command now works correctly with enabled `short paths`. #3600
- Bugfix: Fixed `scm` replacement of the variable when exporting a conanfile. #3576
- Bugfix: *apiv2* was retrying the downloads even when a 404 error was raised. #3562
- Bugfix: Fixed `export_sources` excluded patterns containing symlinks. #3537
- Bugfix: Fixed bug with transitive private dependencies. #3525
- Bugfix: `get_cased_path` crashed when the path didn't exist. #3516

- BugFix: Fixed failures when Conan walk directories with files containing not ASCCI characters in the file name. #3505
- Bugfix: The *scm* feature now looks for the repo root even when the *conanfile.py* is in a subfolder. #3479
- Bugfix: Fixed *OSInfo.bash_path()* when there is no *windows_subsystem*. #3455
- Bugfix: AutotoolsBuildEnvironment was not defaulting the output library directory causing broken consumption of packages when rebuilding from sources in different Linux distros using lib64 default. Read more *here*. #3388

## 17.9 1.7.4 (18-September-2018)

- Bugfix: Fixed a bug in *apiv2*.
- Fix: Disabled *apiv2* by default until it gets more stability.

## 17.10 1.7.3 (6-September-2018)

- Bugfix: Uncontrolled exception was raised while printing the output of an error downloading a file.
- Bugfix: Fixed **`*:option`** pattern for conanfile consumers.

## 17.11 1.7.2 (4-September-2018)

- Bugfix: Reverted default options initialization to empty string with *varname=*.
- Bugfix: Fixed *conan build* command with *–test* and *–install* arguments.

## 17.12 1.7.1 (31-August-2018)

- Fix: Trailing sentences in Conan help command.
- Fix: Removed hardcoded **`-c init.templateDir=`** argument in **`git clone`** for **`conan config install`**, in favor of a new **`--args`** parameter that allows custom arguments.
- Fix: SCM can now handle nested subfolders.
- BugFix: Fix **`conan export-pkg`** unnecessarily checking remotes.

## 17.13 1.7.0 (29-August-2018)

- Feature: Support for C++20 in CMake > 3.12.
- Feature: Included support for Python 3.7 in all platforms.
- Feature: **[Experimental]** New `python_requires` function that allows you to reuse Python code by "requiring" it in Conan packages, even to extend the `ConanFile` class. See: *Python requires: reusing python code in recipes*
- Feature: `CMake` method `patch_config_paths` replaces absolute paths to a Conan package's dependencies as well as to the Conan package itself.

- Feature: `MSBuild` and `VisualStudioBuildEnvironment` build helpers adjust the `/MP` flag to build code in parallel using multiple cores.
- Feature: Added a `print_errors` parameter to `tools.PkgConfig()` helper.
- Feature: Added **`--query`** argument to **`conan upload`**.
- Feature: `virtualenv`/`virtualbuildenv`/`virtualrunenv` generators now create bash scripts in Windows for use in subsystems.
- Feature: Improved resolution speed for version ranges through caching of remote requests.
- Feature: Improved the result of `tools.vcvars_dict(only_diff=True)` including a "list" return type that can be used with `tools.environment_append()`.
- Fix: `AutoToolsBuildEnvironment` build helper now keeps the `PKG_CONFIG_PATHS` variable previously set in the environment.
- Fix: The SCM feature keeps the `.git` folder during the copy of a local directory to the local cache.
- Fix: The SCM feature now correctly excludes the folders ignored by Git during the copy of a local directory to the local cache.
- Fix: Conan messages now spell "overridden" correctly.
- Fix: `MSBuild` build helper arguments using quotes.
- Fix: `vcvars_command` and `MSBuild` build helper use the `amd64_x86` parameter when Visual Studio > 12 and when cross building for x86.
- Fix: Disabled `-c init.TemplateDir` in **`conan config install`** from a Git repository.
- Fix: Clang compiler check in `cmake` generator.
- Fix: Detection of Zypper package tool on latest versions of openSUSE.
- Fix: Improved help output of some commands.
- BugFix: `qmake` generator hyphen.
- Bugfix: Git submodules are now initialized from repo *HEAD* **after** checking out the referenced revision when using the `scm` attribute.
- BugFix: Declaration `default_options` without value, e.g. `default_options = "config="`. Now it will throw an exception.
- BugFix: Deactivate script in `virtualenv` generator causes PS1 to go unset.
- BugFix: Apply general scope options to a consumer ConanFile first.
- BugFix: Fixed detection of a valid repository for Git in the SCM feature.

## 17.14 1.6.1 (27-July-2018)

- Bugfix: **`conan info --build-order`** was showing duplicated nodes for build-requires and private dependencies.
- Fix: Fixed failure with the `alias` packages when the name of the package (excluded the version) was different from the aliased package. Now it is limited in the **`conan alias`** command.

## 17.15 1.6.0 (19-July-2018)

- Feature: Added a new `self.run(..., run_environment=True)` argument, that automatically applies `PATH`, `LD_LIBRARY_PATH` and `DYLD_LIBRARY_PATH` environment variables from the dependencies, to the execution of the current command.
- Feature: Added a new `tools.run_environment()` method as a shortcut to using `tools.environment_append` and `RunEnvironment()` together.
- Feature: Added a new `self.run(..., ignore_errors=True)` argument that represses launching an exception if the commands fails, so user can capture the return code.
- Feature: Improved `tools.Git` to allow capturing the current branch and enabling the export of a package whose version is based on the branch and commit.
- Feature: The `json` generator now outputs settings and options
- Feature: **`conan remote list --raw`** prints remote information in a format valid for *remotes.txt*, so it can be used for `conan config install`
- Feature: Visual Studio generator creates the *conanbuildinfo.props* file using the `$(USERPROFILE)` macro.
- Feature: Added a `filename` parameter to `tools.get()` in case it cannot be deduced from the URL.
- Feature: Propagated `keep_permissions` and `pattern` parameters from `tools.get()` to `tools.unzip()`.
- Feature: Added XZ extensions to `unzip()`. This will only work in Python 3 with lzma support enabled, otherwise, and error is produced.
- Feature: Added `FRAMEWORK_SEARCH_PATHS` var to the Xcode generator to support packaging Apple Frameworks. Read more *here*.
- Feature: Added **`conan build --test`** and a `should_configure` attribute to control the test stage. Read more *here*.
- Feature: New tools to convert between files with LF and CRLF line endings: *tools.unix2dos()* and *tools.dos2unix()*.
- Feature: Added **`conan config install [url] --type=git`** to force cloning of a Git repo for `http://...` git urls.
- Feature: Improved output information when a package is missing in a remote to show which package requires the missing one.
- Feature: Improved the management of an upload interruption to avoid uploads of incomplete tarballs.
- Feature: Added new `LLVM` toolsets to the base `settings.yml` (Visual Studio).
- Feature: Created a plugin for pylint with the previous Conan checks (run in the export) enabling usage of the plugin in IDEs and command line to check if recipes are correct.
- Feature: Improved the `deb` installer to guarantee that it runs correctly in Debian 9 and other distros.
- Fix: Fixed **`conan search -q`** and **`conan remove -q`** to not return packages that don't have the setting specified in the query.
- Fix: Fixed `SystemPackageTool` when calling to update with `sudo` is not enabled and `mode=verify`.
- Fix: Removed `pyinstaller` shared libraries from the linker environment for any Conan subprocess.
- BugFix: The `YumTool` now calls `yum update` instead of `yum check-update`.
- Bugfix: Solved a bug in which using `--manifest` parameter with **`conan create`** caused the deletion of information in the dependency graph.

- Bugfix: Solved bug in which the `build` method of the `Version` model was not showing the version build field correctly .
- Bugfix: Fixed a Conan crash caused by a dependency tree containing transitive private nodes.

## 17.16 1.5.2 (5-July-2018)

- Bugfix: Fixed bug with pre-1.0 packages with sources.
- Bugfix: Fixed regression in private requirements.

## 17.17 1.5.1 (29-June-2018)

- Bugfix: Sources in the local cache weren't removed when using scm pointing to the local source directory, causing changes in local sources not applied to the conan create process.
- Bugfix: Fixed bug causing duplication of build requires in the dependency graph.

## 17.18 1.5.0 (27-June-2018)

- Feature: **`conan search <pkg-ref> -r=all`** now is able to search for binaries too in all remotes
- Feature: Dependency graph improvements: `build_requires` are represented in the graph (visible in **`conan info`**, also in the HTML graph). **`conan install`** and **`conan info`** commands shows extended information of the binaries status (represented in colors in HTML graph). The dependencies declaration order in recipes is respected (as long as it doesn't break the dependency graph order).
- Feature: improved remote management, it is possible to get binaries from different remotes.
- Feature: **`conan user`** command is now able to show authenticated users.
- Feature: Added **`conan user --json`** json output to the command.
- Feature: New `pattern` argument to `tools.unzip()` and `tools.untargz` functions, that allow efficient extraction of certain files only.
- Feature : Added Manjaro support for `SystemPackageTools`.
- Feature: Added `Macos version` subsetting in the default *settings.yml* file, to account for the "min OSX version" configuration.
- Feature: SCM helper argument to recursively clone submodules
- Feature: SCM helper management of subfolder, allows using `exports` and `exports_sources`, manage symlinks, and do not copy files that are *.gitignored*. Also, works better in the local development flow.
- Feature: Modifies user agent header to output the Conan client version and the Python version. Example: `Conan/1.5.0 (Python 2.7.1)`
- Fix: The `CMake()` helper now doesn't require a compiler input to deduce the default generator.
- Fix: **`conan search <pattern>`** now works consistently in local cache and remotes.
- Fix: Proxy related environment variables are removed if *conan.conf* declares proxy configuration.
- Fix: Fixed the parsing of invalid JSON when Microsoft `vswhere` tool outputs invalid non utf-8 text.
- Fix: Applying `winsdk` and `vcvars_ver` to MSBuild and `vcvars_command` for VS 14 too.

- Fix: Workspaces now support `build_requires`.
- Fix: `CMake()` helper now defines by default `CMAKE_EXPORT_NO_PACKAGE_REGISTRY`.
- Fix: Settings constraints declared in recipes now don't error for single strings (instead of a list with a string element).
- Fix: `cmake_minimum_required()` is now before `project()` in templates and examples.
- Fix: `CONAN_SYSREQUIRES_MODE=Disabled` now doesn't try to update the system packages registry.
- Bugfix: Fixed SCM origin path of windows folder (with backslashes).
- Bugfix: Fixed SCM dictionary order when doing replacement.
- Bugfix: Fixed auto-detection of apple-clang 10.0.
- Bugfix: Fixed bug when doing a **`conan search`** without registry file (just before installation).

## 17.19 1.4.5 (22-June-2018)

- Bugfix: The package_id recipe method was being called twice causing issues with info objects being populated with wrong information.

## 17.20 1.4.4 (11-June-2018)

- Bugfix: Fix link order with private requirements.
- Bugfix: Removed duplicate `-std` flag in CMake < 3 or when the standard is not yet supported by `CMAKE_CXX_STANDARD`.
- Bugfix: Check `scm` attribute to avoid breaking recipes with already defined one.
- Feature: Conan workspaces.

## 17.21 1.4.3 (6-June-2018)

- Bugfix: Added system libraries to the cmake_find_package generator.
- Fix: Added SIGTERM signal handler to quit safely.
- Bugfix: Fixed miss-detection of gcc 1 when no gcc was on a Linux machine.

## 17.22 1.4.2 (4-June-2018)

- Bugfix: Fixed multi-config packages.
- Bugfix: Fixed *cppstd* management with CMake and 20 standard version.

## 17.23 1.4.1 (31-May-2018)

- Bugfix: Solved issue with symlinks making recipes to fail with `self.copy`.
- Bugfix: Fixed c++20 standard usage with modern compilers and the creation of the *settings.yml* containing the settings values.
- Bugfix: Fixed error with cased directory names in Windows.
- BugFix: Modified confusing warning message in the SCM tool when the remote couldn't be detected.

## 17.24 1.4.0 (30-May-2018)

- Feature: Added `scm` conanfile attribute, to easily clone/checkout from remote repositories and to capture the remote and commit in the exported recipe when the recipe and the sources lives in the same repository. Read more in "*Recipe and sources in a different repo*" and "*Recipe and sources in the same repo*".
- Feature: Added `cmake_paths` generator to create a file setting `CMAKE_MODULE_PATH` and `CMAKE_PREFIX_PATH` to the packages folders. It can be used as a CMake toolchain to perform a transparent CMake usage, without include any line of cmake code related to Conan. Read more *here*.
- Feature: Added `cmake_find_package` generator that generates one `FindXXX.cmake` file per each dependency both with classic CMake approach and modern using transitive CMake targets. Read more *here*.
- Feature: Added **`conan search --json`** json output to the command.
- Feature: CMake build helper now sets `PKG_CONFIG_PATH` automatically and receives new parameter `pkg_config_paths` to override it.
- Feature: CMake build helper doesn't require to specify "arch" nor "compiler" anymore when the generator is "Unix Makefiles".
- Feature: Introduced default settings for GCC 8, Clang 7.
- Feature: Introduced support for c++ language standard c++20.
- Feature: Auto-managed `fPIC` option in AutoTools build helper.
- Feature: `tools.vcvars_command()` and `tools.vcvars_dict()` now take `vcvars_ver` and `winsdk_version` as parameters.
- Feature: `tools.vcvars_dict()` gets only the env vars set by vcvars with new parameter `only_diff=True`.
- Feature: Generator `virtualbuildenv` now sets Visual Studio env vars via `tool.vcvars_dict()`.
- Feature: New tools for Apple development including XCRun wrapper.
- Fix: Message "Package '1' created" in package commands with `short_paths=True` now shows package ID.
- Fix: `tools.vcvars_dict()` failing to create dictionary due to newlines in vcvars command output.
- Bugfix: `tools.which()` returning directories instead of only files.
- Bugfix: Inconsistent local cache when developing a recipe with `short_paths=True`.
- Bugfix: Fixed reusing MSBuild() helper object for multi-configuration packages.
- Bugfix: Fixed authentication using env vars such as `CONAN_PASSWORD` when `CONAN_NON_INTERACTIVE=True`.
- Bugfix: Fixed Android api_level was not used to adjust CMAKE_SYSTEM_VERSION.

- Bugfix: Fixed MSBuild() build helper creating empty XML node for runtime when the setting was not declared.
- Bugfix: Fixed `default_options` not supporting = in value when specified as tuple.
- Bugfix: AutoToolsBuildEnvironment build helper's `pkg_config_paths` parameter now sets paths relative to the install folder or absolute ones if provided.

## 17.25 1.3.3 (10-May-2018)

- Bugfix: Fixed encoding issues writing to files and calculating md5 sums.

## 17.26 1.3.2 (7-May-2018)

- Bugfix: Fixed broken `run_in_windows_bash` due to wrong argument.
- Bugfix: Fixed `VisualStudioBuildEnvironment` when toolset was not defined.
- Bugfix: Fixed md5 computation of conan .tgz files for recipe, exported sources and packages due to file ordering and flags.
- Bugfix: Fixed `conan download -p=wrong_id` command
- Fix: Added apple-clang 9.1

## 17.27 1.3.1 (3-May-2018)

- Bugfix: Fixed regression with `AutoToolsBuildEnvironment` build helper that raised exception with not supported architectures during the calculation of the GNU triplet.
- Bugfix: Fixed `pkg_config` generator, previously crashing when there was no library directories in the requirements.
- Bugfix: Fixed `conanfile.run()` with `win_bash=True` quoting the paths correctly.
- Bugfix: Recovered parameter "append" to the `tools.save` function.
- Bugfix: Added support (documented but missing) to delete options in `package_id()` method using `del self.info.options.<option>`

## 17.28 1.3.0 (30-April-2018)

- Feature: Added new build types to default `settings.yml`: **RelWithDebInfo** and **MinSizeRel**. Compiler flags will be automatically defined in build helpers that do not understand them (`MSBuild`, `AutotoolsBuildEnvironment`)
- Feature: Improved package integrity. Interrupted downloads or builds shouldn't leave corrupted packages.
- Feature: Added **`conan upload --json`** json output to the command.
- Feature: new **`conan remove --locks`** to clear cache locks. Useful when killing conan.
- Feature: New **CircleCI** template scripts can be generated with the **`conan new`** command.
- Feature: The CMake() build helper manages the fPIC flag automatically based on the options `fPIC` and `shared` when present.

- Feature: Allowing requiring color output with `CONAN_COLOR_DISPLAY=1` environment variable. If `CONAN_COLOR_DISPLAY` is not set rely on tty detection for colored output.
- Feature: New **`conan remote rename`** and **`conan add --force`** commands to handle remotes.
- Feature: Added parameter `use_env` to the `MSBuild().build()` build helper method to control the `/p:UseEnv` msbuild argument.
- Feature: Timeout for downloading files from remotes is now configurable (defaulted to 60 seconds)
- Feature: Improved Autotools build helper with new parameters and automatic set of `--prefix` to `self.package_folder`.
- Feature: Added new tool to compose GNU like triplets for cross-building: `tools.get_gnu_triplet()`
- Fix: Use International Units for download/upload transfer sizes (Mb, Kb, etc).
- Fix: Removed duplicated paths in `cmake_multi` generated files.
- Fix: Removed false positive linter warning for local imports.
- Fix: Improved command line help for positional arguments
- Fix **`-ks`** alias for **`--keep-source`** argument in **`conan create`** and **`conan export`**.
- Fix: removed confusing warnings when `self.copy()` doesn't copy files in the `package()` method.
- Fix: `None` is now a possible value for settings with nested subsettings in `settings.yml`.
- Fix: if `vcvars_command` is called and Visual is not found, raise an error instead of warning.
- Bugfix: `self.env_info.paths` and `self.env_info.PATHS` both map now to PATHS env-var.
- Bugfix: Local flow was not correctly recovering state for option values.
- Bugfix: Windows NTFS permissions failed in case USERDOMAIN env-var was not defined.
- Bugfix: Fixed generator `pkg_config` when there are absolute paths (not use prefix)
- Bugfix: Fixed parsing of settings values with `"="` character in conaninfo.txt files.
- Bugfix: Fixed misdetection of MSYS environments (generation of default profile)
- Bugfix: Fixed string escaping in CMake files for preprocessor definitions.
- Bugfix: `upload --no-overwrite` failed when the remote package didn't exist.
- Bugfix: Don't raise an error if `detect_windows_subsystem` doesn't detect a subsystem.

## 17.29 1.2.3 (10-Apr-2017)

- Bugfix: Removed invalid version field from scons generator.

## 17.30 1.2.1 (3-Apr-2018)

- Feature: Support for *apple-clang 9.1*
- Bugfix: *compiler_args* generator manage correctly the flag for the *cppstd* setting.
- Bugfix: Replaced exception with a warning message (recommending the *six* module) when using *StringIO* class from the *io* module.

## 17.31 1.2.0 (28-Mar-2018)

- Feature: The command **conan build** has new `--configure, --build, --install` arguments to control the different stages of the `build()` method.
- Feature: The command **conan export-pkg** now has a **--package-folder** that can be used to export an exact copy of the provided folder, irrespective of the `package()` method. It assumes the package has been locally created with a previous **conan package** or with a **conan build** using a `cmake.install()` or equivalent feature.
- Feature: New `json` generator, generates a json file with machine readable information from dependencies.
- Feature: Improved proxies configuration with `no_proxy_match` configuration variable.
- Feature: New **conan upload** parameter **--no-overwrite** to forbid the overwriting of recipe/packages if they have changed.
- Feature: Exports are now copied to `source_folder` when doing **conan source**.
- Feature: `tools.vcvars()` context manager has no effect if platform is different from Windows.
- Feature: **conan download** has new optional argument **--recipe** to download only the recipe of a package.
- Feature: Added `CONAN_NON_INTERACTIVE` environment variable to disable interactive prompts.
- Feature: Improved `MSbuild()` build helper using `vcvars()` and generating property file to adjust the runtime automatically. New method `get_command()` with the call to `msbuild` tool. Deprecates `tools.build_sln_command()` and `tools.msvc_build_command()`.
- Feature: Support for clang 6.0 correctly managing cppstd flags.
- Feature: Added configuration to specify a client certificate to connect to SSL server.
- Feature: Improved `ycm` generator to show json dependencies.
- Feature: Experimental `--json` parameter for **conan install** and **conan create** to generate a JSON file with install information.
- Fix: **conan install --build** does not absorb more than one parameter.
- Fix: Made conanfile templates generated with **conan new** PEP8 compliant.
- Fix: **conan search** output improved when there are no packages for the given reference.
- Fix: Made **conan download** also retrieve sources.
- Fix: Pylint now runs as an external process.
- Fix: Made `self.user` and `self.channel` available in test_package.
- Fix: Made files writable after a `deploy()` or `imports()` when `CONAN_READ_ONLY_CACHE`/`general.read_only_cache` environment/config variable is `True`.
- Fix: Linter showing warnings with `cpp_info` object in `deploy()` method.
- Fix: Disabled linter for Conan pyinstaller as it was not able to find the python modules.
- Fix: **conan user -r=remote_name** showed all users for all remotes, not the one given.
- BugFix: Python reuse code failing to import module in `package_info()`.
- BugFix: Added escapes for backslashes in `cmake` generator.
- BugFix: **conan config install** now raises error if **git clone** fails.
- BugFix: Alias resolution not working in diamond shaped dependency trees.

- BugFix: Fixed builds with Cygwin/MSYS2 failing in Windows with *self.short_paths=True* and NTFS file systems due to ACL permissions.
- BugFix: Failed to adjust architecture when running Conan platform detection in ARM devices.
- BugFix: Output to StringIO failing in Python 2.
- BugFix: **`conan profile update`** not working to update `[env]` section.
- BugFix: **`conan search`** not creating default remotes when running it as the very first command after Conan installation.
- BugFix: Package folder was not cleaned after the installation and download of a package had failed.

## 17.32 1.1.1 (5-Mar-2018)

- Feature: `build_sln_command()` and `msvc_build_command()` receive a new optional parameter `platforms` to match the definition of the *.sln* Visual Studio project architecture. (Typically Win32 vs x86 problem).
- Bugfix: Flags for Visual Studio command (cl.exe) using "-" instead of "/" to avoid problems in builds using AutoTools scripts with Visual Studio compiler.
- Bugfix: Visual Studio runtime flags adjusted correctly in `AutoToolsBuildEnvironment()` build helper
- Bugfix: `AutoToolsBuildEnvironment()` build helper now adjust the correct build flag, not using eabi suffix, for architecture x86.

## 17.33 1.1.0 (27-Feb-2018)

- Feature: New **`conan create --keep-build`** option that allows re-packaging from conan local cache, without re-building.
- Feature: **`conan search <pattern> -r=all`** now searches in all defined remotes.
- Feature: Added setting `cppstd` to manage the C++ standard. Also improved build helpers to adjust the standard automatically when the user activates the setting. `AutoToolsBuildEnvironment()`, `CMake()`, `MSBuild()` and `VisualStudioBuildEnvironment()`.
- Feature: New `compiler_args` generator, for directly calling the compiler from command line, for multiple compilers: VS, gcc, clang.
- Feature: Defined `sysrequires_mode` variable (`CONAN_SYSREQUIRES_MODE` env-var) with values `enabled`, `verify`, `disabled` to control the installation of system dependencies via `SystemPackageTool` typically used in *system_requirements()*.
- Feature: automatically apply `pythonpath` environment variable for dependencies containing python code to be reused to recipe `source()`, `build()`, `package()` methods.
- Feature: `CMake` new `patch_config_paths()` methods that will replace absolute paths to conan package path variables, so cmake find scripts are relocatable.
- Feature: new **`--test-build-folder`** command line argument to define the location of the *test_package* build folder, and new conan.conf `temp_test_folder` and environment variable `CONAN_TEMP_TEST_FOLDER`, that if set to True will automatically clean the test_package build folder after running.
- Feature: Conan manages relative urls for upload/download to allow access the server from different configured networks or in domain subdirectories.

- Feature: Added `CONAN_SKIP_VS_PROJECTS_UPGRADE` environment variable to skip the upgrade of Visual Studio project when using *build_sln_command*, the *msvc_build_command* and the *MSBuild()* build helper.
- Feature: Improved detection of Visual Studio installations, possible to prioritize between multiple installed Visual tools with the `CONAN_VS_INSTALLATION_PREFERENCE` env-var and `vs_installation_preference` conan.conf variable.
- Feature: Added `keep_path` parameter to `self.copy()` within the `imports()` method.
- Feature: Added `[build_requires]` section to *conanfile.txt*.
- Feature: Added new **`conan help <command>`** command, as an alternative to **`--help`**.
- Feature: Added `target` parameter to `AutoToolsBuildEnvironment.make` method, allowing to select build target on running make
- Feature: The `CONAN_MAKE_PROGRAM` environment variable now it is used by the `CMake()` build helper to set a custom make program.
- Feature: Added **`--verify-ssl`** optional parameter to **`conan config install`** to allow self-signed SSL certificates in download.
- Feature: `tools.get_env()` helper method to automatically convert environment variables to python types.
- Fix: Added a visible warning about `libcxx` compatibility and the detected one for the default profile.
- Fix: Wrong detection of compiler in OSX for gcc frontend to clang.
- Fix: Disabled *conanbuildinfo.cmake* compiler checks for unknown compilers.
- Fix: `visual_studio` generator added missing *ResourceCompile* information.
- Fix: Don't output password from URL for **`conan config install`** command.
- Fix: Signals exit with error code instead of 0.
- Fix: Added package versions to generated SCons file.
- Fix: Error message when package was not found in remotes has been improved.
- Fix: **`conan profile`** help message.
- Fix: Use gcc architecture flags -m32, -m64 for MinGW as well.
- Fix: `CMake()` helper do not require settings if `CONAN_CMAKE_GENERATOR` is defined.
- Fix: improved output of package remote origins.
- Fix: Profiles files use same structure as **`conan profile show`** command.
- Fix: *conanpath.bat* file is removed after conan Windows installer uninstall.
- Fix: Do not add GCC-style flags -m32, -m64, -g, -s to MSVC when using `AutoToolsBuildEnvironment`
- Fix: "Can't find a binary package" message now includes the Package ID.
- Fix: added clang 5.0 and gcc 7.3 to default *settings.yml*.
- Bugfix: `build_id()` logic does not apply unless the `build_id` is effectively changed.
- Bugfix: `self.install_folder` was not correctly set in all necessary cases.
- Bugfix: **`--update`** option does not ignore local packages for version-ranges.
- Bugfix: Set `self.develop=True` for `export-pkg` command.
- Bugfix: Server HTTP responses were incorrectly captured, not showing errors for some server errors.
- Bugfix: Fixed `config` section update for sequential calls over the python API.

- Bugfix: Fixed wrong `self.develop` set to `False` for **`conan create`** with *test_package*.
- Deprecation: Removed **conan-transit** from default remotes registry.

## 17.34 1.0.4 (30-January-2018)

- Bugfix: Fixed default profile defined in *conan.conf* that includes another profile
- Bugfix: added missing management of `sysroot` in *conanbuildinfo.txt* affecting **`conan build`** and *test_package*.
- Bugfix: Fixed warning in **`conan source`** because of incorrect management of settings.
- Bugfix: Fixed priority order of environment variables defined in included profiles
- Bugfix: NMake error for parallel builds from the `CMake` build helper have been fixed
- Bugfix: Fixed options pattern not applied to root node (`-o *:shared=True` not working for consuming package)
- Bugfix: Fixed shadowed options by package name (`-o *:shared=True -o Pkg:other=False` was not applying `shared` value to Pkg)
- Fix: Using `filter_known_paths=False` as default to `vcvars_dict()` helper.
- Fix: Fixed wrong package name for output messages regarding build-requires
- Fix: Added correct metadata to conan.exe when generated via pyinstaller

## 17.35 1.0.3 (22-January-2018)

- Bugfix: Correct load of stored settings in conaninfo.txt (for **`conan build`**) when `configure()` remove some setting.
- Bugfix: Correct use of unix paths in Windows subsystems (msys, cygwin) when needed.
- Fix: fixed wrong message for **`conan alias --help`**.
- Fix: Normalized all arguments to **`--xxx-folder`** in command line help.

## 17.36 1.0.2 (16-January-2018)

- Fix: Adding a warning message for simultaneous use of `os` and `os_build` settings.
- Fix: Do not raise error from *conanbuildinfo.cmake* for Intel MSVC toolsets.
- Fix: Added more architectures to default *settings.yml* `arch_build` setting.
- Fix: using **`--xxx-folder`** in command line help messages.
- Bugfix: using quotes for Windows bash path with spaces.
- Bugfix: vcvars/vcvars_dict not including windows and windows/system32 directories in the path.

## 17.37 1.0.1 (12-January-2018)

- Fix: **conan new** does not generate cross-building (like `os_build`) settings by default. They make only sense for dev-tools used as `build_requires`
- Fix: *conaninfo.txt* file does not dump settings with None values

## 17.38 1.0.0 (10-January-2018)

- Bugfix: Fixed bug from `remove_from_path` due to Windows path backslash
- Bugfix: Compiler detection in *conanbuildinfo.cmake* for Visual Studio using toolchains like LLVM (Clang)
- Bugfix: Added quotes to bash path.

## 17.39 1.0.0-beta5 (8-January-2018)

- Fix: Errors from remotes different to a 404 will raise an error. Disconnected remotes have to be removed from remotes or use explicit remote with `-r myremote`
- Fix: cross-building message when building different architecture in same OS
- Fix: **conan profile show** now shows profile with same syntax as profile files
- Fix: generated test code in **conan new** templates will not run example app if cross building.
- Fix: **conan export-pkg** uses the *conanfile.py* folder as the default **--source-folder**.
- Bugfix: **conan download** didn't download recipe if there are no binaries. Force recipe download.
- Bugfix: Fixed blocked `self.run()` when stderr outputs large tests, due to full pipe.

## 17.40 1.0.0-beta4 (4-January-2018)

- Feature: `run_in_windows_bash` accepts a dict of environment variables to be prioritized inside the bash shell, mainly intended to control the priority of the tools in the path. Use with `vcvars` context manager and `vcvars_dict`, that returns the PATH environment variable only with the Visual Studio related directories
- Fix: Adding all values to `arch_target`
- Fix: **conan new** templates now use new `os_build` and `arch_build` settings
- Fix: Updated `CMake` helper to account for `os_build` and `arch_build` new settings
- Fix: Automatic creation of *default* profile when it is needed by another one (like `include(default)`)
- BugFix: Failed installation (non existing package) was leaving lock files in the cache, reporting a package for **conan search**.
- BugFix: Environment variables are now applied to `build_requirements()` for **conan install ..**
- BugFix: Dependency graph was raising conflicts for diamonds with **alias** packages.
- BugFix: Fixed **conan export-pkg** after a **conan install** when recipe has options.

## 17.41 1.0.0-beta3 (28-December-2017)

- Fix: Upgraded pylint and astroid to latest
- Fix: Fixed `build_requires` with transitive dependencies to other build_requires
- Fix: Improved pyinstaller creation of executable, to allow for py3-64 bits (windows)
- Deprecation: removed all **`--some_argument`**, use instead **`--some-argument`** in command line.

## 17.42 1.0.0-beta2 (23-December-2017)

- Feature: New command line UI. Most commands use now the path to the package recipe, like **`conan export . user/testing`** or **`conan create folder/myconanfile.py user/channel`**.
- Feature: Better cross-compiling. New settings model for `os_build`, `arch_build`, `os_target`, `arch_target`.
- Feature: Better Windows OSS ecosystem, with utilities and settings model for MSYS, Cygwin, Mingw, WSL
- Feature: `package()` will not warn of not copied files for known use cases.
- Feature: reduce the scope of definition of `cpp_info`, `env_info`, `user_info` attributes to `package_info()` method, to avoid unexpected errors.
- Feature: extended the use of addressing folder and conanfiles with different names for `source`, `package` and `export-pkg` commands
- Feature: added support for Zypper system package tool
- Fix: Fixed application of build requires from profiles that didn't apply to requires in recipes
- Fix: Improved "test package" message in output log
- Fix: updated CI templates generated with **`conan new`**
- Deprecation: Removed `self.copy_headers` and family for the `package()` method
- Deprecation: Removed `self.conanfile_directory` attribute.

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**Note:** This is a beta release, shouldn't be installed unless you do it explicitly

$ pip install conan==1.0.0b2 –upgrade

**Breaking changes**

- The new command line UI breaks command line tools and integration. Most cases, just add a `.` to the command.
- Removed `self.copy_headers`, `self.copy_libs`, methods for `package()`. Use `self.copy()` instead.
- Removed `self.conanfile_directory` attribute. Use `self.source_folder`, `self.build_folder`, etc. instead

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## 17.43 0.30.3 (15-December-2017)

- Reverted `CMake()` and `Meson()` build helpers to keep old behavior.

- Forced Astroid dependency to < 1.6 because of py3 issues.

## 17.44 0.30.2 (14-December-2017)

- Fix: `CMake()` and `Meson()` build helpers and relative directories regression.
- Fix: `ycm` generator, removed the access of `cpp_info` to generators, keeping the access to `deps_cpp_info`.

## 17.45 0.30.1 (12-December-2017)

- Feature: Introduced major versions for gcc (5, 6, 7) as defaults settings for OSS packages, as minors are compatible by default
- Feature: `VisualStudioBuildEnvironment` has added more compilation and link flags.
- Feature: new `MSBuild()` build helper that wraps the call to `msvc_build_command()` with the correct application of environment variables with the improved `VisualStudioBuildEnvironment`
- Feature: `CMake` and `Meson` build helpers got a new `cache_build_dir` argument for `configure(cache_build_dir=None)` that will be used to define a build directory while the package is being built in local cache, but not when built locally
- Feature: `conanfiles` got a new `apply_env` attribute, defaulted to `True`. If false, the environment variables from dependencies will not be automatically applied. Useful if you don't want some dependency adding itself to the PATH by default, for example
- Feature: allow recipes to use and run python code installed with **`conan config install`**.
- Feature: `conanbuildinfo.cmake` now has `KEEP_RPATHS` as argument to keep the RPATHS, as opposed to old SKIP_RPATH which was confusing. Also, it uses set(CMAKE_INSTALL_NAME_DIR "") to keep the old behavior even for CMake >= 3.9
- Feature: **`conan info`** is able to get profile information from the previous install, instead of requiring it as input again
- Feature: `tools.unix_path` support MSYS, Cygwin, WSL path flavors
- Feature: added `destination` folder argument to `tools.get()` function
- Feature: `SystemPackageTool` for apt-get now uses **`--no-install-recommends`** automatically.
- Feature: `visual_studio_multi` generator now uses toolsets instead of IDE version to identify files.
- Fix: generators failures print traces to help debugging
- Fix: typos in generator names, or non-existing generator now raise an Error instead of a warning
- Fix: `short_paths` feature is active by default in Windows. If you want to opt-out, you can use `CONAN_USER_HOME_SHORT=None`
- Fix: `SystemPackageTool` doesn't use sudo in Windows
- BugFix: Not using parallel builds for Visual<10 in CMake build helper.
- Deprecation: `conanfile_directory` shouldn't be used anymore in recipes. Use ``source_folder``, ``build_folder``, etc.

**Note: Breaking changes**

- `scopes` have been completely removed. You can use environment variables, or the `conanfile.develop` or `conanfile.in_local_cache` attributes instead.
- Command *test_package* has been removed. Use **`conan create`** instead, and **`conan test`** for just running package tests.
- `werror` behavior is now by default. Dependencies conflicts will now error, and have to be fixed.
- `short_paths` feature is again active by default in Windows, even with Py3.6 and system LongPathsEnabled.
- `ConfigureEnvironment` and `GCC` build helpers have been completely removed

## 17.46 0.29.2 (2-December-2017)

- Updated python cryptography requirement for OSX due the pyOpenSSL upgrade. See more: https://pypi.org/project/pyOpenSSL/

## 17.47 0.29.1 (23-November-2017)

- Support for OSX High Sierra
- Reverted concurrency locks to counters, removed `psutil` dependency
- Implemented migration for settings.yml (for new VS toolsets)
- Fixed encoding issues in conan_server

## 17.48 0.29.0 (21-November-2017)

- Feature: Support for WindowsStore (WinRT, UWP)
- Feature: Support for Visual Studio Toolsets.
- Feature: New `boost-build` generator for generic bjam (not only Boost)
- Feature: new `tools.PkgConfig` helper to parse pkg-config (.pc) files.
- Feature: Added `self.develop` conanfile variable. It is true for **`conan create`** packages and for local development.
- Feature: Added `self.keep_imports` to avoid removal of imported files in the `build()` method. Convenient for re-packaging.
- Feature: Autodetected MSYS2 for `SystemPackageTool`
- Feature: `AutoToolsBuildEnvironment` now auto-loads `pkg_config_path` (to use with `pkg_config` generator)
- Feature: Changed search for profiles. Profiles not found in the default `profiles` folder, will be searched for locally. Use `./myprofile` to force local search only.
- Feature: Parallel builds for Visual Studio (previously it was only parallel compilation within builds)
- Feature: implemented syntax to check options with `if "something" in self.options.myoption`
- Fix: Fixed CMake dependency graph when using TARGETS, that produced wrong link order for transitive dependencies.

- Fix: Trying to download the `exports_sources` is not longer done if such attribute is not defined
- Fix: Added output directories in `cmake` generator for RelWithDebInfo and MinSizeRel configs
- Fix: Locks for concurrent access to local cache now use process IDs (PIDs) to handle interruptions and inconsistent states. Also, adding messages when locking.
- Fix: Not remove the .zip file after a **`conan config install`** if such file is local
- Fix: Fixed `CMake.test()` for the Ninja generator
- Fix: Do not create local conaninfo.txt file for **`conan install <pkg-ref>`** commands.
- Fix: Solved issue with multiple repetitions of the same command line argument
- BugFix: Don't rebuild conan created (with conan-create) packages when `build_policy="always"`
- BugFix: **`conan copy`** was always copying binaries, now can copy only recipes
- BugFix: A bug in download was causing appends instead of overwriting for repeated downloads.
- Development: Large restructuring of files (new cmd and build folders)
- Deprecation: Removed old CMake helper methods (only valid constructor is `CMake(self)`)
- Deprecation: Removed old `conan_info()` method, that was superseded by `package_id()`

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**Note: Breaking changes**

- CMAKE_LIBRARY_OUTPUT_DIRECTORY definition has been introduced in `conan_basic_setup()`, it will send shared libraries .so to the `lib` folder in Linux systems. Right now it was undefined.
- Profile search logic has slightly changed. For `-pr=myprofile`, such profile will be searched both in the default folder and in the local one if not existing. Use `-pr=./myprofile` to force local search only.
- The **`conan copy`** command has been fixed. To copy all binaries, it is necessary to explicit **`--all`**, as other commands do.
- The only valid use of CMake helper is `CMake(self)` syntax.
- If using `conan_info()`, replace it with `package_id()`.
- Removed environment variable `CONAN_CMAKE_TOOLSET`, now the toolset can be specified as a subsetting of Visual Studio compiler or specified in the build helpers.

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## 17.49 0.28.1 (31-October-2017)

- BugFix: Downloading (`tools.download`) of files with `content-encoding=gzip` were raising an exception because the downloaded content length didn't match the http header `content-length`

## 17.50 0.28.0 (26-October-2017)

This is a big release, with many important and core changes. Also with a huge number of community contributions, thanks very much!

- Feature: Major revamp of most conan commands, making command line arguments homogeneous. Much better development flow adapting to user layouts, with `install-folder`, `source-folder`, `build-folder`, `package-folder`.

- Feature: new `deploy()` method, useful for installing binaries from conan packages
- Feature: Implemented some **concurrency** support for the conan local cache. Parallel **`conan install`** and **`conan create`** for different configurations should be possible.
- Feature: options now allow patterns in command line: `-o *:myoption=myvalue` applies to all packages
- Feature: new `pc` generator that generates files from dependencies for `pkg-config`
- Feature: new `Meson` helper, similar to `CMake` for Meson build system. Works well with `pc` generator.
- Feature: Support for read-only cache with `CONAN_READ_ONLY_CACHE` environment variable
- Feature: new `visual_studio_multi` generator to load Debug/Release, 32/64 configs at once
- Feature: new `tools.which` helper to locate executables
- Feature: new **`conan --help`** layout
- Feature: allow to override compiler version in `vcvars_command`
- Feature: **`conan user`** interactive (and not exposed) password input for empty `-p` argument
- Feature: Support for `PacManTool` for `system_requirements()` for ArchLinux
- Feature: Define VS toolset in `CMake` constructor and from environment variable CONAN_CMAKE_TOOLSET
- Feature: **`conan create`** now accepts `werror` argument
- Feature: `AutoToolsBuildEnvironment` can use `CONAN_MAKE_PROGRAM` env-var to define make program
- Feature: added xcode9 for apple-clang 9.0, clang 5 to default settings.yml
- Feature: deactivation of `short_paths` in Windows 10 with Py3.6 and long path support is automatic
- Feature: show unzip progress by percentage, not by file (do not clutters output)
- Feature: do not use `sudo` for system requirements if already running as root
- Feature: `tools.download` able to use headers/auth
- Feature: conan does not longer generate bytecode from recipes (no more .pyc, and more efficient)
- Feature: add parallel argument to `build_sln_command` for VS
- Feature: Show warning if vs150comntools is an invalid path
- Feature: `tools.get()` now has arguments for hash checking
- Fix: upload pattern now accepts `Pkg/*`
- Fix: improved downloader, make more robust, better streaming
- Fix: `tools.patch` now support adding/removal of files
- Fix: The `default` profile is no longer taken as a base and merged with user profile. Use explicit `include(default)` instead.
- Fix: properly manage x86 as cross building with autotools
- Fix: `tools.unzip` removed unnecessary long-paths check in Windows
- Fix: `package_info()` is no longer executed at install for the consumer conanfile.py
- BugFix: source folder was not being correctly removed when recipe was updated
- BugFix: fixed `CMAKE_C_FLAGS_DEBUG` definition in `cmake` generator

- BugFix: `CMAKE_SYSTEM_NAME` is now Darwin for iOS, watchOS and tvOS
- BugFix: `xcode` generator fixed handling of compiler flags
- BugFix: pyinstaller hidden import that broke .deb installer
- BugFix: **`conan profile list`** when local files matched profile names

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**Note: Breaking changes**

This is an important release towards stabilizing conan and moving out of beta. Some breaking changes have been done, but mostly to command line arguments, so they should be easy to fix. Package recipes or existing packages shouldn't break. Please **update**, it is very important to ease the transition of future stable releases. Do not hesitate to ask questions, or for help if you need it. This is a possibly not complete list of things to take into account:

- The command **`conan install`** doesn't accept `cwd` anymore, to change the directory where the generator files are written, use the **`--install-folder`** parameter.
- The command **`conan install`** doesn't accept **`--all`** anymore. Use **`conan download <ref>`** instead.
- The command **`conan build`** now requires the path to the `conanfile.py` (optional before)
- The command **`conan package`** not longer re-package a package in the local cache, now it only operates in a user local folder. The recommended way to re-package a package is using **`conan build`** and then **`conan export-pkg`**.
- Removed **`conan package_files`** in favor of a new command **`conan export-pkg`**. It requires a local recipe with a `package()` method.
- The command **`conan source`** no longer operates in the local cache. now it only operates in a user local folder. If you used **`conan source`** with a reference to workaround the concurrency, now it natively supported, you can remove the command call and trust concurrent install processes.
- The command **`conan imports`** doesn't accept `-d, --dest` anymore, use **`--imports-folder`** parameter instead.
- If you specify a profile in a conan command, like conan create or conan install the base profile *~/.conan/profiles/default* won't be applied. Use explicit `include` to keep the old behavior.

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## 17.51 0.27.0 (20-September-2017)

- Feature: **`conan config install <url>`** new command. Will install remotes, profiles, settings, conan.conf and other files into the local conan installation. Perfect to synchronize configuration among teams
- Feature: improved traceback printing when errors are raised for more context. Configurable via env
- Feature: filtering out non existing directories in `cpp_info` (include, lib, etc), so some build systems don't complain about them.
- Feature: Added include directories to ResourceCompiler and to MIDL compiler in `visual_studio` generator
- Feature: new `visual_studio_legacy` generator for Visual Studio 2008
- Feature: show path where manifests are locally stored
- Feature: `replace_in_file` now raises error if replacement is not done (opt-out parameter)
- Feature: enabled in conan.conf `[proxies]` section `no_proxy=url1,url2` configuration (to skip proxying for those URLs), as well as `http=None` and `https=None` to explicitly disable them.

- Feature: new conanfile `self.in_local_cache` attribute for conditional logic to apply in user folders local commands
- Feature: `CONAN_USER_HOME_SHORT=None` can disable the usage of `short_paths` in Windows, for modern Windows that enable long paths at the system level
- Feature: `if "arm" in self.settings.arch` is now a valid check (without casting to str(self.settings.arch))
- Feature: added cwd‘‘ argument to **`conan source`** local method.
- Fix: unzip crashed for 0 Bytes zip files
- Fix: `collect_libs` moved to the `tools` module
- Bugfix: fixed wrong regex in `deps_cpp_info` causing issues with dots and dashes in package names
- Development: Several internal refactorings (tools module, installer), testing (using VS2015 as default, removing VS 12 in testing). Conditional CI in travis for faster builds in developers, downgrading to CMake 3.7 in appveyor
- Deprecation: `dev_requires` have been removed (it was not documented, but accessible via the `requires(dev=True)` parameter. Superseded by `build_requires`.
- Deprecation: sources tgz files for exported sources no longer contain ".c_src" subfolder. Packages created with 0.27 will be incompatible with conan < 0.25

## 17.52 0.26.1 (05-September-2017)

- Feature: added apple-clang 9.0 to default settings.
- Fix: **`conan copy`** command now supports symlinks.
- Fix: fixed removal of "export_source" folder when files have no permissions
- Bugfix: fixed parsing of *conanbuildinfo.txt* with package names containing dots.

## 17.53 0.26.0 (31-August-2017)

- Feature: **`conan profile`** command has implemented `update`, `new`, `remove` subcommands, with detect‘‘, to allow creation, edition and management of profiles.
- Feature: **`conan package_files`** command now can call recipe `package()` method if build_folder‘‘ or source_folder‘‘ arguments are defined
- Feature: graph loading algorithm improved to avoid repeating nodes. Results in much faster times for dense graphs, and avoids duplications of private requirements.
- Feature: authentication based on environment variables. Allows very long processes without tokens being expired.
- Feature: Definition of Visual Studio runtime setting `MD` or `MDd` is now automatic based on build type, not necessary to default in profile.
- Feature: Capturing `SystemExit` to return user error codes to the system with `sys.exit(code)`
- Feature: Added SKIP_RPATH argument to cmake `conan_basic_setup()` function
- Feature: Optimized uploads, now uploads will be skipped if there are no changes, irrespective of timestamp
- Feature: Automatic detection of VS 15-2017, via both a `vs150comntools` variable, and using `vswhere.exe`

- Feature: Added NO_OUTPUT_DIRS argument to cmake `conan_basic_setup()` function
- Feature: Add support for Chocolatey system package manager for Windows.
- Feature: Improved in conan user home and path storage configuration, better error checks.
- Feature: `export` command is now able to export recipes without name or version, specifying the full reference.
- Feature: Added new default settings, Arduino, gcc-7.2
- Feature: Add conan settings to cmake generated file
- Feature: new `tools.replace_prefix_in_pc_file()` function to help with .pc files.
- Feature: Adding support for system package tool `pkgutil` on Solaris
- Feature: **`conan remote update`** now allows **`--insert`** argument to change remote order
- Feature: Add `verbose` definition to `CMake` helper.
- Fix: **`conan package`** working locally failed if not specified build_folder
- Fix: Search when using wildcards for version like `Pkg/*@user/channel`
- Fix: Change current working directory to the conanfile.py one before loading it, so relative python imports or code work.
- Fix: `package_files` command now works with `short_paths` too.
- Fix: adding missing require of tested package in test_package/conanfile build() method
- Fix: path joining in `vcvars_command` for custom VS paths defined via env-vars
- Fix: better managing string escaping in CMake variables
- Fix: `ExecutablePath` assignment has been removed from the `visual_studio` generator.
- Fix: removing `export_source` folder containing exported code, fix issues with read-only files and keeps cache consistency better.
- Fix: Accept 100 return code from yum check-update
- Fix: importing *.so files from the **`conan new`** generated test templates
- Fix: progress bars display when download/uploads are not multipart (reported size 0)
- Bugfix: fixed wrong OSX `DYLD_LIBRARY_PATH` variable for virtual environments
- Bugfix: `FileCopier` had a bug that affected `self.copy()` commands, changing base reference directory.

## 17.54 0.25.1 (20-July-2017)

- Bugfix: Build requires are now applied correctly to test_package projects.
- Fix: Fixed search command to print an error when –table parameter is used without a reference.
- Fix: install() method of the CMake() helper, allows parallel building, change build folder and custom parameters.
- Fix: Controlled errors in migration, print warning if conan is not able to remove a package directory.

## 17.55 0.25.0 (19-July-2017)

**Note:** This release introduces a new layout for the local cache, with dedicated `export_source` folder to store the source code exported with `exports_sources` feature, which is much cleaner than the old `.c_src` subfolder. A migration is included to remove from the local cache packages with the old layout.

- Feature: new **`conan create`** command that supersedes *test_package* for creating and testing package. It works even without the test_package folder, and have improved management for user, channel. The test_package recipe no longer defines `requires`
- Feature: new **`conan get`** command that display (with syntax highlight) package recipes, and any other file from conan: recipes, conaninfo.txt, manifests, etc.
- Feature: new **`conan alias`** command that creates a special package recipe, that works like an **alias** or a **proxy** to other package, allowing easy definition and transparent management of "using the latest minor" and similar policies. Those special alias packages do not appear in the dependency graph.
- Feature: new **`conan search --table=file.html`** command that will output an html file with a graphical representation of available binaries
- Feature: created **default profile**, that replace the `[settings_default]` in **conan.conf** and augments it, allowing to define more things like env-vars, options, build_requires, etc.
- Feature: new `self.user_info` member that can be used in `package_info()` to define custom user variables, that will be translated to general purpose variables by generators.
- Feature: **`conan remove`** learned the **`--outdated`** argument, to remove those binary packages that are outdated from the recipe, both from local cache and remotes
- Feature: **`conan search`** learned the **`--outdated`** argument, to show only those binary packages that are outdated from the recipe, both from local cache and remotes
- Feature: Automatic management `CMAKE_TOOLCHAIN_FILE` in `CMake` helper for cross-building.
- Feature: created `conan_api`, a python API interface to conan functionality.
- Feature: new `cmake.install()` method of `CMake` helper.
- Feature: `short_paths` feature now applies also to `exports_sources`
- Feature: `SystemPackageTool` now supports **FreeBSD** system packages
- Feature: `build_requires` now manage options too, also default options in package recipes
- Feature: **`conan build`** learned new **`--package_folder`** argument, useful if the build system perform the packaging
- Feature: `CMake` helper now defines by default `CMAKE_INSTALL_PREFIX` pointing to the current package_folder, so `cmake.install()` can transparently execute the packaging.
- Feature: improved command UX with cwd'' arguments to allow define the current directory for the command
- Feature: improved `VisualStudioBuildEnvironment`
- Feature: transfers now show size (MB, KB) of download/uploaded files, and current status of transfer.
- Feature: **`conan new`** now has arguments to generate CI scripts for Gitlab CI.
- Feature: Added `MinRelSize` and `RelWithDebInfo` management in `CMake` helper.
- Fix: make `mkdir`, `rmdir`, `relative_dirs` available for import from **`conans`** module.
- Fix: improved detection of Visual Studio default under cygwin environment.

- Fix: `package_files` now allows symlinks
- Fix: Windows installer now includes conan_build_info tool.
- Fix: appending environment variables instead of overwriting them when they come from different origins: upstream dependencies and profiles.
- Fix: made opt-in the check of package integrity before uploads, it was taking too much time, and provide little value for most users.
- Fix: Package recipe linter removed some false positives
- Fix: default settings from conan.conf do not fail for constrained settings in recipes.
- Fix: Allowing to define package remote with **`conan remote add_ref`** before download/upload.
- Fix: removed duplicated BUILD_SHARED_LIBS in test_package
- Fix: add "rhel" to list of distros using yum.
- Bugfix: allowing relative paths in `exports` and `exports_sources` fields
- Bugfix: allow custom user generators with underscore

## 17.56 0.24.0 (15-June-2017)

- Feature: **`conan new`** new arguments to generate **Travis-CI** and **Appveyor** files for Continuous Integration
- Feature: Profile files with `include()` and variable declaration
- Feature: Added `RelWithDebInfo/MinRelSize` to cmake generators
- Feature: Improved linter, removing false positives due to dynamic conanfile attributes
- Feature: Added `tools.ftp_download()` function for FTP retrieval
- Feature: Managing symlinks between folders.
- Feature: **`conan remote add`** command learned new insert`` option to add remotes in specific order.
- Feature: support multi-config in the `SCons` generator
- Feature: support for gcc 7.1+ detection
- Feature: `tools` now are using global `requests` and `output` instances. Proxies will work for `tools.download()`
- Feature: json`` parameter added to **`conan info`**` command to create a JSON with the `build_order`.
- Fix: update default repos, now pointing to Bintray.
- Fix: printing `outdated from recipe` also for remotes
- Fix: Fix required slash in `configure_dir` of `AutoToolsBuildEnvironment`
- Fix: command `new` with very short names, now errors earlier.
- Fix: better error detection for incorrect `Conanfile.py` letter case.
- Fix: Improved some cmake robustness using quotes to avoid cmake errors
- BugFix: Fixed incorrect firing of building due to build`` patterns error
- BugFix: Fixed bug with options incorrectly applied to `build_requires` and crashing
- Refactor: internal refactorings toward having a python api to conan functionality

## 17.57 0.23.1 (05-June-2017)

- BugFix: Fixed bug while packaging symlinked folders in build folder, and target not being packaged.
- Relaxed OSX requirement of pyopenssl to <18

## 17.58 0.23.0 (01-June-2017)

- Feature: new `build_requires` field and `build_requirements()` in package recipes
- Feature: improved commands (source, build, package, package_files) and workflows for local development of packages in user folders.
- Feature: implemented `no_copy_source` attribute in recipes to avoid the copy of source code from "source" to "build folder". Created new `self.source_folder`, `self.build_folder`, `self.package_folder` for recipes to use.
- Feature: improved `qmake` generator with multi-config support, resource directories
- Feature: improved exception capture and formatting for all recipe user methods exceptions
- Feature: new `tools.sha256()` method
- Feature: folder symlinks working now for packages and upload/download
- Feature: added `set_find_paths()` to `cmake-multi`, to set CMake FindXXX.cmake paths. This will work only for single-config build-systems.
- Feature: using environment variables for `configure()`, `requirements()` and `test()` methods
- Feature: added a `pylintrc` environment variable in `conan.conf` to define a PYLINTRC file with custom style definitions (like indents).
- Feature: fixed `vcvars` architecture setting
- Fix: Make `cacert.pem` folder use CONAN_USER_HOME if existing
- Fix: fixed `options=a=b` option definition
- Fix: `package_files` command allows force'' argument to overwrite existing instead of failing
- BugFix: Package names with underscore when parsing `conanbuildinfo.txt`

## 17.59 0.22.3 (03-May-2017)

- Fix: Fixed CMake generator (in targets mode) with linker/exe flags like –framework XXX containing spaces.

## 17.60 0.22.2 (20-April-2017)

- Fix: Fixed regression with usernames starting with non-alphabetical characters, introduced by 0.22.0

## 17.61 0.22.1 (18-April-2017)

- Fix: "-" symbol available again in usernames.
- Fix: Added `future` requirement to solve an error with pyinstaller generating the Windows installer.

## 17.62 0.22.0 (18-April-2017)

- Feature: `[build_requires]` can now be declared in `profiles` and apply them to build packages. Those requirements are only installed if the package is required to build from sources, and do not affect its package ID hash, and it is not necessary to define them in the package recipe. Ideal for testing libraries, cross compiling toolchains (like Android), development tools, etc.
- Feature: Much improved support for cross-building. Support for cross-building to **Android** provided, with toolchains installable via `build_requires`.
- Feature: New `package_files` command, that is able to create binary packages directly from user files, without needing to define `build()` or `package()` methods in the the recipes.
- Feature: command **`conan new`** with a new bare'' option that will create a minimal package recipe, usable with the `package_files` command.
- Feature: Improved `CMake` helper, with `test()` method, automatic setting of BUILD_SHARED_LIBS, better management of variables, support for parallel compilation in MSVC (via /MP)
- Feature: new `tools.msvc_build_command()` helper that both sets the Visual vcvars and calls Visual to build the solution. Also `vcvars_command` is improved to return non-empty string even if vcvars is set, for easier concatenation.
- Feature: Added package recipe linter, warning for potential errors and also about Python 3 incompatibilities when running from Python 2. Enabled by default can be opt-out.
- Feature: Improvements in HTML output of **`conan info --graph`**.
- Feature: allow custom path to bash, as configuration and environment variable.
- Fix: Not issuing an unused variable warning in CMake for the CONAN_EXPORTED variable
- Fix: added new `mips` architectures and latest compiler versions to default settings.yml
- Fix: Unified username allowed patterns to those used in package references.
- Fix: hardcoded vs15 version in tools.vcvars
- BugFix: Clean crash and improved error messages when manifests mismatch exists in conan upload.

## 17.63 0.21.2 (04-April-2017)

- Bugfix: virtualenv generator quoting environment variables in Windows.

## 17.64 0.21.1 (23-March-2017)

- BugFix: Fixed missing dependencies in `AutoToolsBuildEnvironment`
- BugFix: Escaping single quotes in html graph of **`conan info --graph=file.html`**.

- BugFix: Fixed loading of auth plugins in conan_server
- BugFix: Fixed `visual_studio` generator creating XML with dots.

## 17.65 0.21.0 (21-March-2017)

- Feature: **`conan info --graph`** or graph=file.html‘‘ will generate a dependency graph representation in dot or html formats.
- Feature: Added better support and tests for Solaris Sparc.
- Feature: custom authenticators are now possible in **`conan_server`**` with plugins.
- Feature: extended **`conan info`** command with path information and filter by packages.
- Feature: enabled conditional binary packages removal with **`conan remove`** with query syntax
- Feature: enabled generation and validation of manifests from *test_package*.
- Feature: allowing `options` definitions in profiles
- Feature: new `RunEnvironment` helper, that makes easier to run binaries from dependent packages
- Feature: new `virtualrunenv` generator that activates environment variable for execution of binaries from installed packages, without requiring `imports` of shared libraries.
- Feature: adding new version modes for ABI compatibility definition in `package_id()`.
- Feature: Extended **`conan new`** command with new option for `exports_sources` example recipe.
- Feature: `CMake` helper defining parallel builds for gcc-like compilers via jN‘‘, allowing user definition with environment variable and in conan.conf.
- Feature: **`conan profile`**` command now show profiles in alphabetical order.
- Feature: extended `visual_studio` generator with more information and binary paths for execution with DLLs paths.
- Feature: Allowing relative paths with $PROFILE_DIR place holder in `profiles`
- Fix: using only file checksums to decide for modified recipe in remote, for possible concurrent builds & uploads.
- Fix: Improved build‘‘ modes management, with better checks and allowing multiple definitions and mixtures of conditions
- Fix: Replaced warning for non-matching OS to one message stating the cross-build
- Fix: local **`conan source`**` command (working in user folder) now properly executes the equivalent of `exports` functionality
- Fix: Setting command line arguments to cmake command as CMake flags, while using the TARGETS approach. Otherwise, arch flags like -m32 -m64 for gcc were not applied.
- BugFix: fixed **`conan imports`** destination folder issue.
- BugFix: Allowing environment variables with spaces
- BugFix: fix for CMake with targets usage of multiple flags.
- BugFix: Fixed crash of `cmake_multi` generator for “multi-config” packages.

## 17.66 0.20.3 (06-March-2017)

- Fix: Added opt-out for `CMAKE_SYSTEM_NAME` automatically added when cross-building, causing users providing their own cross-build to fail
- BugFix: Corrected usage of `CONAN_CFLAGS` instead of `CONAN_C_FLAGS` in cmake targets

## 17.67 0.20.2 (02-March-2017)

- Fix: Regression of `visual_studio``generator using ``%(ExecutablePath)` instead of `$(ExecutablePath)`
- Fix: Regression for build=outdated –build=Pkg‘‘ install pattern

## 17.68 0.20.1 (01-March-2017)

- Fix: Disabled the use of cached settings and options from installed `conaninfo.txt`
- Fix: Revert the use of quotes in `cmake` generator for flags.
- Fix: Allow comments in artifacts.properties
- Fix: Added missing commit for CMake new helpers

## 17.69 0.20.0 (27-February-2017)

**NOTE:** It is important that if you upgrade to this version, all the clients connected to the same remote, should upgrade too. Packages created with conan>=0.20.0 might not be usable with conan older conan clients.

- Feature: Largely improved management of **environment variables**, declaration in `package_info()`, definition in profiles, in command line, per package, propagation to consumers.
- Feature: New build helpers `AutotoolsBuildEnvironment`, `VisualStudioBuildEnvironment`, which deprecate `ConfigureEnvironment`, with much better usage of environment variables
- Feature: New `virtualbuildenv` generator that will generate a composable environment with build information from installed dependencies.
- Feature: New `build_id()` recipe method that allows to define logic to build once, and package multiple times without building. E.g.: build once both debug and release artifacts, then package separately.
- Feature: **Multi-config packages**. Now packages can provide multi-configuration packages, like both debug/release artifacts in the same package, with `self.cpp_info.debug.libs = [...]` syntax. Not restricted to debug/release, can be used for other purposes.
- Feature: new **`conan config`** command to manage, edit, display `conan.conf` entries
- Feature: *Improvements* to `CMake` build helper, now it has `configure()` and `build()` methods for common operations.
- Feature: Improvements to `SystemPackageTool` with detection of installed packages, improved implementation, installation of multi-name packages.
- Feature: Unzip with `tools.unzip` maintaining permissions (Linux, OSX)
- Feature: **`conan info`** command now allows profiles too

- Feature: new tools `unix_path()`, `escape_windows_cmd()`, `run_in_windows_bash()`, useful for autotools projects in Win/MinGW/Msys
- Feature: new context manager `tools.chdir`, to temporarily change directory.
- Feature: CMake using `CMAKE_SYSTEM_NAME` for cross-compiling.
- Feature: Artifactory build-info extraction from traces
- Feature: Attach custom headers to artifacts uploads with an *artifacts.properties* file.
- Feature: allow and copy symlinks while **`conan export`**
- Fix: removing quotes in some cmake variables that were generating incorrect builds
- Fix: providing better error messages for non existing binaries, with links to the docs
- Fix: improved error messages if `tools.patch` failed
- Fix: adding `resdirs` to `cpp_info` propagated information, and cmake variables, for directories containing resources and other data.
- Fix: printing error messages if a build‘‘ policy doesn't match any package
- Fix: managing VS2017 by `tools`. Still the manual definition of `vs150comntools` required.
- Bug fix: crashes when not supported characters were dumped to terminal by logger
- Bug fix: wrong executable path in Visual Studio generator

## 17.70 0.19.3 (27-February-2017)

- Fix: backward compatibility for new environment variables. New features to be introduced in 0.20 will produce that `conaninfo.txt` will not be correctly parsed, and then package would be "missing". This will happen for packages created with 0.20, and consumed with older than 0.19.3

NOTE: It is important that you upgrade at least to this version if you are using remotes with packages that might be created with latest conan releases (like conan.io).

## 17.71 0.19.2 (15-February-2017)

- Bug fix: Fixed bug with remotes behind proxies
- Bug fix: Fixed bug with `exports_sources` feature and nested folders

## 17.72 0.19.1 (02-February-2017)

- Bug fix: Fixed issue with **`conan copy`** followed by **`conan upload`** due to the new `exports_sources` feature.

## 17.73 0.19.0 (31-January-2017)

- Feature: `exports_sources` allows to snapshot sources (like `exports`) but retrieve them strictly when necessary, to build from sources. This can largely improve install times for package recipes containing sources

- Feature: new configurable **tracer** able to create structured logs of conan actions: commands, API calls, etc
- Feature: new logger for `self.run` actions, able to log information from builds and other commands to files, that can afterwards be packaged together with the binaries.
- Feature: support for **Solaris SunOS**
- Feature: `Version` helper improved with `patch`, `pre`, `build` capabilities to handle `1.3.4-alpha2+build1` versions
- Feature: compress level of tgz is now configurable via `CONAN_COMPRESSION_LEVEL` environment variable, default 9. Reducing it can lead to faster compression times, at the expense of slightly bigger archives
- Feature: Add **powershell** support for virtualenv generator in Windows
- Feature: Improved `system_requirements()` raising errors when failing, retrying if not successful, being able to execute in user space for local recipes
- Feature: new cmake helper macro `conan_target_link_libraries()`.
- Feature: new cmake `CONAN_EXPORTED` variable, can be used in CMakeLists.txt to differentiate building in the local conan cache as package and building in user space
- Fix: improving the caching of options from **`conan install`** in conaninfo.txt and precedence.
- Fix: conan definition of cmake output dirs has been disabled for `cmake_multi` generator
- Fix: `imports()` now uses environment variables at "conan install" (but not at "conan imports" yet)
- Fix: `conan_info()` method has been renamed to `package_id()`. Backward compatibility is maintained, but it is strongly encouraged to use the new name.
- Fix: `conan_find_libraries` now use the NO_CMAKE_FIND_ROOT_PATH parameter for avoiding issue while cross-compiling
- Fix: disallowing duplicate URLs in remotes, better error management
- Fix: improved error message for wildcard uploads not matching any package
- Fix: remove deprecated `platform.linux_distribution()`, using new "distro" package
- Bugfix: fixed management of `VerifySSL` parameter for remotes
- Bugfix: fixed misdetection of compiler version in conanbuildinfo.cmake for apple-clang
- Bugfix: fixed trailing slash in remotes URLs producing crashes
- Refactor: A big refactor has been do to `options`. Nested options are no longer supported, and `option.suboption` will be managed as a single string option.

This has been a huge release with contributors of 11 developers. Thanks very much to all of them!

## 17.74 0.18.1 (11-January-2017)

- Bug Fix: Handling of transitive private dependencies in modern cmake targets
- Bug Fix: Missing quotes in CMake macro for modern cmake targets
- Bug Fix: Handling LINK_FLAGS in cmake modern targets
- Bug Fix: Environment variables no propagating to test project with test_package command

## 17.75 0.18.0 (3-January-2017)

- Feature: uploads and downloads with **retries** on failures. This helps to avoid having to fully rebuild on CI when a network transfer fails
- Feature: added **SCons** generator
- Feature: support for **Python 3.6**, with several fixes. Added Python 3.6 to CI.
- Feature: show package dates in **`conan info`** command
- Feature: new `cmake_multi` generator for multi-configuration IDEs like Visual Studio and Xcode
- Feature: support for **Visual Studio 2017**, VS-15
- Feature: **FreeBSD** now passes test suite
- Feature: **`conan upload`** showing error messages or URL of remote
- Feature: **wildcard or pattern upload**. Useful to upload multiple packages to a remote.
- Feature: allow defining **settings as environment variables**. Useful for use cases like dockerized builds.
- Feature: improved help‘‘ messages
- Feature: cmake helper tools to launch conan directly from cmake
- Added **code coverage** for code repository
- Fix: conan.io badges when containing dash
- Fix: manifests errors due to generated .pyc files
- Bug Fix: unicode error messages crashes
- Bug Fix: duplicated build of same binary package for private dependencies
- Bug Fix: duplicated requirement if using version-ranges and `requirements()` method.

## 17.76 0.17.2 (21-December-2016)

- Bug Fix: ConfigureEnvironment helper ignoring libcxx setting. #791

## 17.77 0.17.1 (15-December-2016)

- Bug Fix: conan install –all generating corrupted packages. Thanks to @yogeva
- Improved case sensitive folder management.
- Fix: appveyor links in README.

## 17.78 0.17.0 (13-December-2016)

- Feature: support for **modern cmake** with cmake `INTERFACE IMPORTED` targets defined per package
- Feature: support for more advanced queries in search.
- Feature: new `profile list|show` command, able to list or show details of profiles

- Feature: adding preliminary support for **FreeBSD**
- Feature: added new `description` field, to document package contents.
- Feature: generation of **imports manifest** and **`conan imports --undo`** functionality to remove imported files
- Feature: optional SSL certificate verification for remotes, to allow self signed certificates
- Feature: allowing custom paths in profiles, so profiles can be easily shared in teams, just inside the source repository or elsewhere.
- Feature: fields `user` and `channel` now available in conan recipes. That allows to declare requirements for the same user/channel as the current package.
- Feature: improved conan.io package web, adding description.
- Fix: allow to modify cmake generator in `CMake` helper class.
- Fix: added `strip` parameter to `tools.patch()` utility
- Fix: removed unused dependency to Boto
- Fix: wrong line endings in Windows for conan.conf
- Fix: proper automatic use of `txt` and `env` generators in *test_package*
- Bug fix: solved problem when uploading python packages that generated .pyc at execution
- Bug fix: crash when duplicate requires were declared in conanfile
- Bug fix: crash with existing imported files with symlinks
- Bug fix: options missing in "copy install command to clipboard" in web

## 17.79 0.16.1 (05-December-2016)

- Solved bug with *test_package* with arguments, like scopes.

## 17.80 0.16.0 (19-November-2016)

**Upgrade**: The build=outdated`` feature had a change in the hash computation, it might report outdated binaries from recipes. You can re-build the binaries or ignore it (if you haven't changed your recipes without re-generating binaries)

- Feature: **version ranges**. Conan now supports defining requirements with version range expressions like `Pkg/[>1.2,<1.9||1.0.1]@user/channel`. Check the *version ranges reference* for details
- Feature: decoupled `imports` from normal install. Now **`conan install --no-imports`** skips the imports section.
- Feature: new **`conan imports`** command that will execute the imports section without running install
- Feature: **overriding settings per package**. Now it is possible to specify individual settings for each package. This can be specified both in the command line and in `profiles`
- Feature: **environment variables** definition in the command line, global and per package. This allows to define specific environment variables as the compiler (CC, CXX) for a specific package. These environment variables can also be defined in `profiles`. Check *profiles reference*
- Feature: Now conan files copies handle **symlinks**, so files are not duplicated. This will save some space and improve download speed in some large packages. To enable it, use `self.copy(..., links=True)`

- Fix: Enabling correct use of **MSYS** in Windows, by using the Windows `C:/...` path instead of the MSYS ones
- Fix: Several fixes in **`conan search`**, both local and in remotes
- Fix: Manifests line endings and order fix, and hash computation fixed (it had wrong ordering)
- Fix: Removed http->https redirection in conan_server that produced some issues for SSL reversed proxies
- Fix: Taking into account "ANY" definition of settings and options
- Fix: Improved some error messages and failures to encode OS errors with unicode characters
- Update: added new arch `ppc64` to default settings
- Update: updated python-requests library version
- Fix: Using `generator()` instead of compiler to decide on cmake multi-configuration for Ninja+cl builds
- Improved and completed documentation

## 17.81 0.15.0 (08-November-2016)

**Upgrade**: If you were using the `short_paths` feature in Windows for packages with long paths, please reset your local cache. You could manually remove packages or just run **`conan remove "*"`**

- Feature: New build=outdated`` functionality, that allows to build the binary packages for those dependencies whose recipe has been changed, or if the binary is not existing. Each binary package stores a hash of the recipe to know if they have to be regenerated (are outdated). This information is also provided in the **`conan search <ref>`** command. Useful for package creators and CI.
- Feature: Extended the `short_paths` feature for Windows path limit to the `package` folder, so package with very long paths, typically in headers in nested folder hierarchies are supported.
- Feature: New `tool.build_sln_command()` helper to `build()` Microsoft Visual Studio solution (.sln) projects
- Feature: Extended the `source` and `package` command, so together with `build` they can be fully executed in a user folder, as a convenience for package creation and testing.
- Feature: Extending the scope of `tools.pythonpath` to work in local commands too
- Improved the parsing of `profiles` and better error messages
- Not adding `-s` compiler flag for clang, as it doesn't use it.
- Automatic generation of *conanenv.txt* in local cache, warnings if using local commands and no `conanbuildinfo.txt` and no *conanenv.txt* are present to cache the information form install
- Fix: Fixed bug when using empty initial requirements (`requires = ""`)
- Fix: Added `glob` hidden import to pyinstaller
- Fix: Fixed minor bugs with `short_paths` as local search not listing packages
- Fix: Fixed problem with virtual envs in Windows with paths separator (using / instead of )
- Fix: Fixed parsing of conanbuildinfo.txt, so the root folder for each dependency is available in local commands too
- Fix: Fixed bug in *test_package* with the test project using the `requirements()` method.

## 17.82 0.14.1 (20-October-2016)

- Fixed bug with *short_paths* feature in windows.
- Improved error messages for non-valid *profile* test files.
- Remove downloaded tgz package files from remotes after decompress them.
- Fixes bug with *install –all* and short_paths

## 17.83 0.14.0 (20-October-2016)

- Feature: Added profiles, as user predefined settings and environment variables (as CC and CXX for compiler paths). They are stored in files in the conan cache, so they can be easily edited, added, and shared. Use them with **`conan install --profile=name`**
- Feature: `short_paths` feature for Windows now also handle long paths for the final package, in case that a user library has a very long final name, with nested subfolders.
- Feature: Added `tools.cpu_count()` as a helper to retrieve the number of cores, so it can be used in concurrent builds
- Feature: Detects cycles in the dependency graph, and raise error instead of exhausting recursion limits
- Feature: Conan learned the werror‘‘ option that will raise error and stop installation under some cases treated as warnings otherwise: Duplicated dependencies, or dependencies conflicts
- Feature: New `env` generator that generates a text file with the environment variables defined by dependencies, so it can be stored. Such file is parsed by **`conan build`** to be able to use such environment variables for `self.deps_env_info` too, in the same way it uses the `txt` generator to load variables for `self.deps_cpp_info`.
- Fix: Do not print progress bars when output is a file
- Fix: Improved the local conan search, using options too in the query **`conan search -q option=value`**
- Fix: Boto dependency updated to 2.43.0 (necessary for ArchLinux)
- Fix: Simplified the **`conan package`** command, removing unused and confusing options, and more informative messages about errors and utility of this command.
- Fix: More fixes and improvements on `ConfigureEnvironment`, mainly for Windows
- Fix: Conan now does not generate a `conanbuildinfo.txt` file when doing **`conan install <PkgRef>`**.
- Bug fix: Files of a package recipe are “touched” to update their timestamps to current time when retrieved, otherwise some build systems as Ninja can have problems with them.
- Bug fix: `qmake` generator now uses quotes to handle paths with spaces
- Bug fix: Fixed `OSInfo` to return the short distro name instead of the long one.
- Bug fix: fixed transitivity of `private` dependencies

## 17.84 0.13.3 (13-October-2016)

This minor solves some problems with `ConfigureEnvironment`, mainly for Windows, but also fixes other things:

- Fixed concatenation problems in Windows for several environment variables. Fixed problems with path with spaces
- A batch file is created in Windows to be called, as `if defined` structures doesn't seem to work in the command line.
- The `vcvars_command` from `tools` now checks the Visual Studio environment variable, if it is already set, it will check it with the current project settings, throwing an error if not matching, returning an empty command if matches.
- Added a `compile_flags` property to `ConfigureEnvironment`, to be passed in the command line to the compiler, but not as environment variables
- Added `defines` to environment for nix systems, it was not being handled before
- Added new tests, compiling simple projects and diamond dependencies with cmake, cl (msvc), gcc (gcc in linux, mingw in win) and clang (OSX), for a better coverage of the `ConfigureEnvironment` functionality.
- Fixed wrong `CPP_INCLUDE_PATH`, it is now `CPLUS_INCLUDE_PATH`

## 17.85 0.13.0 (03-October-2016)

**IMPORTANT UPGRADE ISSUE:** There was a small error in the computation of binary packages IDs, that has been addressed by conan 0.13. It affects to third level (and higher) binary packages, i.e. A and B in A->B->C->D, which binaries **must** be regenerated for the new hashes. If you don't plan to provide support for older conan releases (<=0.12), which would be reasonable, you should remove all binaries first (**`conan remove -p`**, works both locally and remotely), then re-build your binaries.

Features:

- Streaming from/to disk for all uploads/downloads. Previously, this was done for memory, but conan started to have issues for huge packages (>many hundreds MBs), that sometimes could be alleviated using Python 64 bits distros. This issues should be alleviated now
- New security system that allows capturing and checking the package recipes and binaries manifests into user folders (project or any other folder). That ensures that packages cannot be replaced, hacked, forged, changed or wrongly edited, either locally or in any remote server, without notice.
- Possible to handle and reuse python code in recipes. Actually, conan can be used as a package manager for python, by adding the package path to `env_info.PYTHONPATH`. Useful if you want to reuse common python code between different package recipes.
- Avoiding re-compress the tgz for packages after uploads if it didn't change.
- New command **`conan source`** that executes the `source()` method of a given conanfile. Very useful for CI, if desired to run in parallel the construction of different binaries.
- New propagation of `cpp_info`, so it now allows for capturing binary packages libraries with new `collect_libs()` helper, and access to created binaries to compute the `package_info()` in general.
- Command *test_package* now allows the update`` option, to automatically update dependencies.
- Added new architectures for `ppc64le` and detection for `AArch64`
- New methods for defining requires effect over binary packages ID (hash) in `conan_info()`
- Many bugs fixes: error in `tools.download` with python 3, restore correct prompt in virtualenvs, bug if removing an option in `config_options()`, setup.py bug...

This release has contributions from @tru, @raulbocanegra, @tivek, @mathieu, and the feedback of many other conan users, thanks very much to all of them!

## 17.86 0.12.0 (13-September-2016)

- Major changes to **search** api and commands. Decoupled the search of package recipes, from the search of binary packages.
- Fixed bug that didn't allow to `export` or `upload` packages with settings restrictions if the restrictions didn't match the host settings
- Allowing disabling color output with `CONAN_COLOR_DISPLAY=0` environment variable, or to configure color schema for light console backgrounds with `CONAN_COLOR_DARK=1` environment variable
- Imports can use absolute paths, and files copied from local conan cache to those paths will not be removed when **`conan install`**. Can be used as a way to install machine-wise things (outside conan local cache)
- More robust handling of failing transfers (network disconnect), and inconsistent status after such
- Large internal refactor for storage managers. Improved implementations and decoupling between server and client
- Fixed slow **`conan remove`** for caches with many packages due to slow deletion of empty folders
- Always allowing explicit options scopes, `-o Package:option=value` as well as the implicit `-o option=value` for current `Package`, for consistency
- Fixed some bugs in client-server auth process.
- Allow to extract `.tar` files in `tools.unzip()`
- Some helpers for `conan_info()`, as `self.info.requires.clear()` and removal of settings and options

## 17.87 0.11.1 (31-August-2016)

- New error reporting for failures in conanfiles, including line number and offending line, much easier for package creators
- Removed message requesting to create an account in **conan.io** for other remotes
- Removed localhost:9300 remote that was added by default mostly for demo purposes. Clarified in docs.
- Fixed usernames case-sensitivity in conan_server, due to ConfigParser it was forcing lowercase
- Handling unicode characters in remote responses, fixed crash
- Added new compilers gcc 6.2, clang 8.0 to the default `settings.yml`
- Bumped cryptography, boto and other conan dependencies, mostly for ArchLinux compatibility and new OSX security changes

## 17.88 0.11.0 (3-August-2016)

- New solution for the path length limit in Windows, more robust and complete. Package conanfile.py just have to declare an attribute `short_paths=True` and everything will be managed. The old approach is deprecated and totally removed, so no shorts_paths.conf file is necessary. It should fix also the issues with uploads/retrievals.
- New `virtualenv` generator that generates `activate` and `deactivate` scripts that set environment variables in the current shell. It is very useful, for example to install tools (like CMake, MinGW) with conan

packages, so multiple versions can be installed in the same machine, and switch between them just by activating such virtual environments. Packages for MinGW and CMake are already available as a demo

- ConfigureEnvironment takes into account environment variables, defined in packages in new `env_info`, which is similar to `cpp_info` but for environment information (like paths).
- New per-package `build_policy`, which can be set to `always` or `missing`, so it is not necessary to create packages or specify the build`` parameter in command line. Useful for example in header only libraries or to create packages that always get the latest code from a branch in a github repository.
- Command **`conan test_package`** now executes by default a **`conan export`** with smarter package reference deduction. It is introduced as opt-out behavior.
- Conan :command`export` command avoids copying *test_package/build* temporary files in case of `export=*`
- Now, `package_info()` allows absolute paths in `includedir`, `libdirs` and `bindirs`, so wrapper packages can be defined that use system or manually installed libraries.
- LDFLAGS in `ConfigureEnvironment` management of OSX frameworks.
- Options allow the `ANY` value, so such option would accept any value. For example a commit of a git repository, useful to create packages that can build any specific commit of a git repo.
- Added gcc 5.4 to the default settings, as well as MinGW options (Exceptions, threads...)
- Command **`conan info`** learned a new option to output the packages from a project dependency tree that should be rebuilt in case of a modification of a certain package. It outputs a machine readable **ordered** list of packages to be built in that order. Useful for CI systems.
- Better management of incomplete, dirty or failed `source` directories (e.g. in case of a user interrupting with Ctrl+C a git clone inside the `source()` method.
- Added tools for easier detection of different OS versions and distributions, as well as command wrappers to install system packages (apt, yum). They use `sudo` via a new environment variable CONAN_SYSREQUIRES_SUDO, so using sudo is opt-in/out, for users with different sudo needs. Useful for `system_requirements()`
- Deprecated the `config()` method (still works, for backwards compatibility), but has been replaced by a `config_options()` to modify options based on settings, and a `configure()` method for most use cases. This removes a nasty behavior of having the `config()` method called twice with side effects.
- Now, running a **`conan install MyLib/0.1@user/channel`** to directly install packages without any consuming project, is also able to generate files with the `-g` option. Useful for installing tool packages (MinGW, CMake) and generate `virtualenvs`.
- Many small fixes and improvements: detect compiler bug in Py3, search was crashing for remotes, conan new failed if the package name had a dash, etc.
- Improved some internal duplications of code, refactored many tests.

This has been a big release. Practically 100% of the released features are thanks to active users feedback and contributions. Thanks very much again to all of them!

## 17.89 0.10.0 (29-June-2016)

- **conan new** command, that creates conan package conanfile.py templates, with a *test_package* package test (-t option), also for header only packages (-i option)
- Definition of **scopes**. There is a default **dev** scope for the user project, but any other scope (test, profile...) can be defined and used in packages. They can be used to fire extra processes (as running tests), but they do not affect the package binaries, and are not included in the package IDs (hash).

- Definition of **dev_requires**. Those are requirements that are only retrieved when the package is in **dev** scope, otherwise they are not. They do not affect the binary packages. Typical use cases would be test libraries or build scripts.
- Allow **shorter paths** for specific packages, which can be necessary to build packages with very long path names (e.g. Qt) in Windows.
- Support for bzip2 and gzip decompression in `tools`
- Added `package_folder` attribute to conanfile, so the `package()` method can for example call `cmake install` to create the package.
- Added `CONAN_CMAKE_GENERATOR` environment variable that allows to override the `CMake` default generator. That can be useful to build with Ninja instead of the default Unix Makefiles
- Improved `ConfigureEnvironment` with include paths in CFLAGS and CPPFLAGS, and fixed bug.
- New **`conan user --clean`** option, to completely remove all user data for all remotes.
- Allowed to raise `Exceptions` in `config()` method, so it is easier for package creators to raise under non-supported configurations
- Fixed many small bugs and other small improvements

As always, thanks very much to all contributors and users providing feedback.

## 17.90 0.9.2 (11-May-2016)

- **Fixed download bug** that made it specially slow to download, even crash. Thanks to github @melmdk for fixing it.
- **Fixed cmake check of CLang**, it was being skipped
- **Improved performance**. Check for updates has been removed from install, made it opt-in in **`conan info`** command, as it was very slow, seriously affecting performance of large projects.
- Improved internal representation of graph, also improves performance for large projects.
- Fixed bug in **`conan install --update`**.

## 17.91 0.9 (3-May-2016)

- **Python 3** "experimental" support. Now the main conan codebase is Python 2 and 3 compatible. Python 2 still the reference platform, Python 3 stable support in next releases.
- Create and share your **own custom generators for any build system or tool**. With "generator packages", you can write a generator just as any other package, upload it, modify and version it, etc. Require them by reference, as any other package, and pull it into your projects dynamically.
- **Premake4** initial experimental support via a generator package.
- Very large **re-write of the documentation**. New "creating packages" sections with in-source and out-source explicit examples. Please read it! :)
- Improved **`conan test`**. Renamed `test` to *test_package* both for the command and the folder, but backwards compatibility remains. Custom folder name also possible. **Adapted test layout** might require minor changes to your package test, automatic warnings added for your convenience.
- Upgraded pyinstaller to generate binary OS installers from 2.X to 3.1

- **conan search** now has command line options:, less verbose, verbose, extra verbose
- Added variable with full list of dependencies in conanbuildinfo.cmake
- Several minor bugfixes (check github issues)
- Improved **conan user** to manage user login to multiple remotes

## 17.92 0.8.4 (28-Mar-2016)

- Fixed linker problems with the new apple-clang 7.3 due to libraries with no timestamp set.
- Added apple-clang 7.3 to default settings
- Fixed default libcxx for apple-clang in auto detection of base conan.conf

## 17.93 0.8 (15-Mar-2016)

- New **conan remote** command to manage remotes. Redesigned remotes architecture, now allows to work with several remotes in a more consistent, powerful and "git-like" way. New remotes registry keeps track of the remote of every installed package, and this information is shown in **conan info** command too. Also, it keeps different user logins for different remotes, to improve support in corporate environments running in-house servers.
- New **update** functionality. Now it is possible to **conan install --update** to update packages that became obsolete because new ones were uploaded to the corresponding remote. Conan commands as install and info show information about the status of the local packages compared with the remote ones. In this way, using latest versions during development is much more natural.
- Added new **compiler.libcxx** setting in order to support the different c++ standard libraries. It can take libstdc++, libstdc++11 or libc++ values to take into account different standard libraries for modern gcc and clang compilers. It is also possible to remove not needed settings, like this one in pure C projects, with the new syntax: `del self.settings.compiler.libcxx`
- Conan **virtual environment**: Define a custom conan directory with **CONAN_USER_HOME** env variable, and have a per project or per workspace storage for your dependencies. So you can isolate your dependencies and even bundle them within your project, by just setting the CONAN_USER_HOME variable to your `<project>/deps` folder, for example. This also improves support for continuous integration CI systems, in which many builds from different users could be run in parallel.
- Better conanfile download method. More stable and now checks (opt-out) the **ssl certificates**.
- Lots of improvements: Increased library name length limit, Improved and cleaner output messages.
- Fixed several minor bugs: removing empty folders, case sensitive exports, arm settings detection.
- Introduced the concept of **"package recipe"** that refers to conanfile.py and exported files.
- Improved settings display in web, with new "copy install command to clipboard" to assist in installing packages discovered in web.
- The macOS installer, problematic with latest macOS releases, has been deprecated in favor of homebrew and pip install procedures.

## 17.94 0.7 (5-Feb-2016)

- Custom conanfile names are allowed for developing. With file‘‘ option you can define the file you want to use, allowing for `.conaninfo.txt` or having multiple `conanfile_dev.py`, `conanfile_test.py` besides the standard `conanfile.py` which is used for sharing the package. Inheritance is allowed, e.g. `conanfile_dev.py` might extend/inherit from `conanfile.py`.
- New **`conan copy`** command that can be used to copy/rename packages, promote them between channels, forking other users packages.
- New all‘‘ and package‘‘ options for **`conan install`** that allows to download one, several, or all package configurations for a given reference.
- Added `patch()` tool to easily patch sources if necessary.
- New **qmake** and **qbs** generators
- Upload of conanfile **exported** files is also **tgz'd**, allowing fast upload/downloads of full sources if desired, avoiding retrieval of sources from externals sources.
- **`conan info`** command improved showing info of current project too
- Output of `run()` can be redirected to buffer string for processing, or even removed.
- Added **proxy** configuration to conan.conf for users behinds proxies.
- Large improvements in commands output, prefixed with package reference, and much clear.
- Updated settings for more versions of gcc and new arm architectures
- Treat dependencies includes as SYSTEM in cmake, so no warnings are raised
- Deleting source folder after **`conan export`** so no manual removal is needed
- Normalizing to CRLF generated user files in Win
- Better detection and checks for compilers as VS, apple-clang
- Fixed CMAKE_SHARED_LINKER_FLAGS typo in cmake files
- Large internal refactor in generators

## 17.95 0.6 (11-Jan-2016)

- New cmake variables in cmake generator to make FindPackage work better thanks to the underlaying FindLibrary. Now many FindXXX.cmake work “as-is” and the package creator does not have to create a custom override, and consumers can use packages transparently with the originals FindXXX.cmakes
- New “conan info” command that shows the full dependency graph and details (license, author, url, dependants, dependencies) for each dependency.
- New environment helper with a ConfigureEnvironment class, that is able to translate conan information to autotools configure environment definition
- Relative importing from conanfiles now is possible. So if you have common functionality between different packages, you can reuse those python files by importing them from the conanfile.py. Note that export=”...” might be necessary, as packages as to be self-contained.
- Added YouCompleteMe generator for vim auto-completion of dependencies.

- New "conanfile_directory" property that points to the file in which the conanfile.py is located. This helps if using the conanfile.py "build" method to build your own project as a project, not a package, to be able to use any workflow, out-of-source builds, etc.
- Many edits and improvements in help, docs, output messages for many commands.
- All cmake syntax in modern lowercase
- Fixed several minor bugs: gcc detection failure when gcc not installed, missing import, copying source->build failing when symlinks

## 17.96 0.5 (18-Dec-2015)

- New cmake functionality allows package creators to provide cmake finders, so that package consumers can use their CMakeLists.txt with typical FindXXX.cmake files, without any change to them. CMake CONAN_CMAKE_MODULES_PATH added, so that package creators can provide any additional cmake scripts for consumers.
- Now it is possible to generate out-of-source and multiple configuration installations for the same project, so you can switch between them without having to **`conan install`** again. Check *the new workflows*
- New qmake generator (thanks @dragly)
- Improved removal/deletion of folders with shutil.rmtree, so **`conan remove`** commands and other processes requiring deletion of folders do not fail due to permissions and require manual deletion. This is an improvement, especially in Win.
- Created `pip` package, so conan can be installed via: `pip install conan`
- Released `pyinstaller` code for the creation of binaries from conan python source code. Distros package creators can create packages for the conan apps easily from those binaries.
- Added md5, sha1, sha256 helpers in `tools`, so external downloads from `conanfile.py` files `source()` can be checked.
- Added latest gcc versions to default `settings.yml`
- Added CI support for conan development: travis-ci, appveyor
- Improved human-readability for download progress, help messages.
- Minor bug fixes