

二. 简单介绍

cmake (<http://www.cmake.org/>) 的介绍, 可以 [Google](#)。

接触 C++ 项目的人都知道, 现在存在很多组织源代码进行编译的工具, windows 平台下的 nmake, visual studio (不同版本的 sln project 文件) 以及 Eclipse 的 CDT。cmake 所处的位置, 更像是这些已有工具的管理工具, 它可以根据 cmakeLists 文件来生成相应的 makefile, project 文件等等。

使用 cmake 的好处有很多。编写一次配置文件, 就可以在不同的开发平台, 不同的编译环境下使用。强大的定制功能, 弥补很多工具自身的不足。自动化管理依赖, 节省开发人员的时间和编译时间。等等。

当然也有他的不足。每一个工具都是有自己的局限性。学习曲线比较陡峭。编译过程变的稍微复杂, 需要首先生成中间格式的文件, 然后才能编译生成最终的文件。学习资料很少很散。

有好处有坏处, 需要的就是权衡。在我看来, cmake 提供的功能比较诱人, 将代码的配置信息与 build 环境剥离。这样做为程序员提供了很大的灵活性。

下载安装都很简单, 直接到 cmake 的主页上下载安装包, 按提示操作。

三. 文件目录结构

在每一层目录下创建一个 cmakeLists.txt 的文件, 父目录的 cmakeLists 文件可以指定包含的子目录, 子目录的 cmakeLists 则管理该目录下所有的 sourcecode。目录可以多层嵌套, 组织比较灵活, 但是不建议目录层数太深。

Dir Helloworld

The project

| File cmakelists.txt
should define the whole project' s properties and include sub dir

| Dir HelloworldTest
function

| | File cmakelists.txt
the source files, compiler flags and link flags.

| | File main.cpp

| Dir Hellowould

| | File cmakelists.txt
define all source files and build flags

| | File helloworld.h

| | File helloworld.cpp

The project main cmakelists.txt, which

The app dir, which contains the main

The app cmakelists.txt, which defines all

The cpp file

The library dir

The library cmakelists.txt, which should

header file

cpp file

从上边的目录结构可以看出，每一层目录下边都有一个 cmakelists.txt。

文件内容：

Helloworld/cmakelists.txt

```
CMAKE_MINIMUM_REQUIRED( VERSION 2.8 )
```

```
project( Helloworld )
```

```
set( CMAKE_EXE_LINKER_FLAGS "${CMAKE_EXE_LINKER_FLAGS} /machine:x86" )
```

```
add_subdirectory( Helloworld )
```

```
add_subdirectory( Helloworldtest )
```

```
Helloworld/Helloworld/cmakelists.txt
```

```
CMAKE_MINIMUM_REQUIRED( VERSION 2.8 )
```

```
set( HelloWorldSrc helloworld.cpp helloworld.h )
```

```
add_library( Helloworld STATIC ${HelloWorldSrc} )
```

```
Helloworld/HelloworldTest/cmakelists.txt
```

```
CMAKE_MINIMUM_REQUIRED( VERSION 2.8 )
```

```
set( HelloWorldTestSrc main.cpp)
```

```
include_directories( "${Helloworld_SOURCE_DIR}/Helloworld" )
```

```
add_executable( HelloworldTest ${HelloWorldTestSrc} )
```

```
target_link_libraries(HelloworldTest Helloworld )  
add_dependencies( HelloworldTest Helloworld )
```

以上是最简单的 cmake 应用，使用了很基础的 cmake 命令，这里简单描述一下：

`cmake_minimum_required(VERSION 2.8)`：表示当前 `cmakelists` 文件要求 cmake 版本最低为 2.8

`project(Helloworld)`：整个项目的名字，在我们的项目中，Helloworld。这个在 visual studio 中对应 solution 的名字。

`set(NAME VAL1 VAL2)`：设置变量 NAME，值为 VAL1;VAL2 的列表。CMAKE 中列表使用;分隔。如果需要空格分隔的结果，可以用双引号转换。

`include_directories()`：包含一个目录

`add_executable()`：增加一个编译单元，目标文件为可执行文件，在 windows 上则为 exe 文件。

`add_library()`：添加一个编译单元，目标文件为库。

以上命令的详细解释，可以参考 cmake 的帮助文档。

四。外部库的引入

所有源文件都存放在一个目录下的项目，现实生活中这样的情况并不多见。最经常见到的情形是，我们自己的项目 A，依赖于第三方库 B, C, D。这里的第三方库包含类似于 boost 这样的公共库，也包含我们自己编写的独立库。

未完

附录：Visual Studio 属性与对应 cmakeLists 实现方法：

注意：此附录仅为 beta 版本，有些条目是推导出来的。

Visual Studio			Cmake
Project Reference			add_dependencies()
General/Output Directory			
Debugging/Working Directory			CMAKE can't set this value, because the info not stored in project file but some intermedia file generated by visual studio

c/c++	General	Additional Include Directories	include_directories()
		Resolve #using References	Don' t know
		Debug Information Format	CMAKE FAQ set(CMAKE_C_FLAGS_DEBUG_INIT "/D_DEBUG /MTd /Zi /Ob0 /Od /RTC1") set(CMAKE_C_FLAGS_MINSIZEREL_INIT "/MT /O1 /Ob1 /D NDEBUG") set(CMAKE_C_FLAGS_RELEASE_INIT "/MT /O2 /Ob2 /D NDEBUG") set(CMAKE_C_FLAGS_RELWITHDEBINFO_INIT "/MT /Zi /O2 /Ob1 /D NDEBUG") Change the default flags for specific config.
		Common language runtime support	set_target_properties(target PROPERTIES COMPILE_FLAGS "/clr") set_target_properties(target PROPERTIES COMPILE_FLAGS "/clr:pure") set_target_properties(target PROPERTIES COMPILE_FLAGS "/clr:safe") set_target_properties(target PROPERTIES COMPILE_FLAGS "/clr:oldSynax")

		Suppress Startup Banner	set_target_properties(target PROPERTIES COMPILE_FLAGS “/nologo”)
		Warning Level	set_target_properties(target PROPERTIES COMPILE_FLAGS “/W0”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/W1”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/W2”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/W3”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/W4”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/Wall”)
		Treat Warnings As Errors	set_target_properties(target PROPERTIES COMPILE_FLAGS “/WX-”) #No set_target_properties(target PROPERTIES COMPILE_FLAGS “/WX”) #Yes
		Multi- processor Compilation	set_target_properties(target PROPERTIES COMPILE_FLAGS “/MP”) #Yes #Don’ t set means No
		Use Unicode For Assembler Listing	set_target_properties(target PROPERTIES COMPILE_FLAGS “/FAu”) #yes #Don’ t set means no

	Optimization	Optimization	<pre>set(CMAKE_C_FLAGS_DEBUG_INIT "/D_DEBUG /MTd /Zi /Ob0 /Od /RTC1") set(CMAKE_C_FLAGS_MINSIZEREL_INIT "/MT /O1 /Ob1 /D NDEBUG") set(CMAKE_C_FLAGS_RELEASE_INIT "/MT /O2 /Ob2 /D NDEBUG") set(CMAKE_C_FLAGS_RELWITHDEBINFO_INIT "/MT /Zi /O2 /Ob1 /D NDEBUG")</pre> <p>Change the default flags for specific config.</p>
		Inline Function Expansion	<pre>set(CMAKE_C_FLAGS_DEBUG_INIT "/D_DEBUG /MTd /Zi /Ob0 /Od /RTC1") set(CMAKE_C_FLAGS_MINSIZEREL_INIT "/MT /O1 /Ob1 /D NDEBUG") set(CMAKE_C_FLAGS_RELEASE_INIT "/MT /O2 /Ob2 /D NDEBUG") set(CMAKE_C_FLAGS_RELWITHDEBINFO_INIT "/MT /Zi /O2 /Ob1 /D NDEBUG")</pre> <p>Change the default flags for specific config.</p>
		Enable Intrinsic Functions	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/Oi") #yes #Don' t set means no</pre>
		Favor Size or Speed	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/Os") #size</pre>

			<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/Ot”) #speed #Don’ t set means neither</pre>
		Omit Frame Pointers	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/Oy-”) #no set_target_properties(target PROPERTIES COMPILE_FLAGS “/Oy”) #yes</pre>
		Enable Fiber-safe Optimizations	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/GT”) #yes #not setting means no</pre>
		Whole Program Optimization	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/GL”) #yes #not setting means no</pre>
	Preprocessor	Preprocessor Definitions	<pre>set_target_properties(target PROPERTIES COMPILE_DEFINITIONS DEFNAME=DEFVAL) set_source_files_properties(filename.cpp PROPERTIES COMPILE_DEFINITIONS DEFNAME=DEFVAL)</pre>
		Undefine Preprocessor Definitions	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/UDEFNAME”)</pre>
		Undefine All Preprocessor Definitions	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS “/u”)</pre>

		Ignore Standard Include Path	set_target_properties(target PROPERTIES COMPILE_FLAGS “/X”)
		Preprocess to a File	set_target_properties(target PROPERTIES COMPILE_FLAGS “/P”)
		Preprocess Suppress Line Numbers	set_target_properties(target PROPERTIES COMPILE_FLAGS “/EP”)
		Keep Comments	set_target_properties(target PROPERTIES COMPILE_FLAGS “/C”)
	Code Generation	Enable String Pooling	set_target_properties(target PROPERTIES COMPILE_FLAGS “/GF”) #yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/GF-”) #no
		Enable Minimum Rebuild	set_target_properties(target PROPERTIES COMPILE_FLAGS “/Gm”) #yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/Gm-”)#no
		Enable C++ Exceptions	set_target_properties(target PROPERTIES COMPILE_FLAGS “/EHsc”) #yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/EHa”) #yes, with SEH exceptions set_target_properties(target PROPERTIES

			COMPILE_FLAGS “/EHs”) #yes, with extern C functions #not setting means no
		Smaller Type Check	set_target_properties(target PROPERTIES COMPILE_FLAGS “/RTCc”) #yes #not setting means no
		Basic Runtime Checks	set_target_properties(target PROPERTIES COMPILE_FLAGS “/RTCs”) #Stack frame check set_target_properties(target PROPERTIES COMPILE_FLAGS “/RTCu”) #Uninitialized Variable set_target_properties(target PROPERTIES COMPILE_FLAGS “/TRC1”) #Both #not setting means no
		Runtime Library	CMAKE FAQ set(CMAKE_C_FLAGS_DEBUG_INIT “/D_DEBUG / MTd /Zi /Ob0 /Od /RTC1”) set(CMAKE_C_FLAGS_MINSIZEREL_INIT “/ MT /O1 /Ob1 /D NDEBUG”) set(CMAKE_C_FLAGS_RELEASE_INIT “/ MT /O2 /Ob2 /D NDEBUG”) set(CMAKE_C_FLAGS_RELWITHDEBINFO_INIT “/ MT /Zi /O2 /Ob1 /D NDEBUG”)

			Change the default flags for specific config.
		Struct Member Alignment	set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zp1”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zp2”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zp4”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zp8”)set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zp16”)
		Buffer Security Check	set_target_properties(target PROPERTIES COMPILE_FLAGS “/GS”) #yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/GS-”) #no
		Enable Function-Level Linking	set_target_properties(target PROPERTIES COMPILE_FLAGS “/Gy”) #yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/Gy-”) #no
		Enable Enhanced Instruction Set	set_target_properties(target PROPERTIES COMPILE_FLAGS “/arch:SSE”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/arch:SSE2”)

		Floating Point Model	set_target_properties(target PROPERTIES COMPILE_FLAGS “/fp:precise”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/fp:strict”) set_target_properties(target PROPERTIES COMPILE_FLAGS “/fp:fast”)
		Enable Floating Point Exceptions	set_target_properties(target PROPERTIES COMPILE_FLAGS “/fp:except”)
		Create Hotpatchable Image	set_target_properties(target PROPERTIES COMPILE_FLAGS “/hotpatch”)
	Language	Disable Language Extensions	set_target_properties(target PROPERTIES COMPILE_FLAGS “/Za”)
		Treat Wchar_t As Built in Type	set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zc:wchar_t”)#yes set_target_properties(target PROPERTIES COMPILE_FLAGS “/Zc:wchar_t-”) #no
		Force Conformance in For Loop Scope	

		Enable Run-Time Type Information	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/GR") #yes set_target_properties(target PROPERTIES COMPILE_FLAGS "/GR-") #no</pre>
		Open MP Support	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/openmp")#yes set_target_properties(target PROPERTIES COMPILE_FLAGS "/openmp-")#no</pre>
	PreCompiled Header	PreCompiled Header	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/Yc") #create set_target_properties(target PROPERTIES COMPILE_FLAGS "/Yu") #use #not setting means no</pre>
		PreCompiled Header File	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/Ycstdafx.h") set_target_properties(target PROPERTIES COMPILE_FLAGS "/Yustdafx.h")</pre>
		Precompiled Header output File	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/FpPathAndName.pch")</pre>
	Output Files	Expand Attributed Source	<pre>set_target_properties(target PROPERTIES COMPILE_FLAGS "/Fx")</pre>

		Assembler Output	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FA") set_target_properties(target PROPERTIES COMPILE_FLAGS "/FAc") set_target_properties(target PROPERTIES COMPILE_FLAGS "/FAs") set_target_properties(target PROPERTIES COMPILE_FLAGS "/Facs") #not setting means no list
		ASM List Location	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FaDebug")
		Object File name	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FoName.obj")
		Program DataBase File Name	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FdC:/Debug/good.pdb")
		Generate XML Documentation Files	set_target_properties(target PROPERTIES COMPILE_FLAGS "/doc")
		XML Documentation Filename	set_target_properties(target PROPERTIES COMPILE_FLAGS "/docDocument.xml")
	Browse Information	Enable Browse Information	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FR")

		Browse Information File	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FRfilename")
	Advanced	Calling Convention	set_target_properties(target PROPERTIES COMPILE_FLAGS "/Gd") #_cdecl set_target_properties(target PROPERTIES COMPILE_FLAGS "/Gr") #_fastcall set_target_properties(target PROPERTIES COMPILE_FLAGS "/Gz") #_stdcall
		Compile As	set_target_properties(target PROPERTIES LINKER_LANGUAGE "CXX") #C++ set_target_properties(target PROPERTIES LINKER_LANGUAGE "C") #C or set_target_properties(target PROPERTIES COMPILE_FLAGS "/TP") #CXX set_target_properties(target PROPERTIES COMPILE_FLAGS "/TC") #C
		Disable Specific Warnings	set_target_properties(target PROPERTIES COMPILE_FLAGS "/wd4710")
		Forced Include File	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FIinclude.h")

		Forced #using File	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FUname")
		Show Includes	set_target_properties(target PROPERTIES COMPILE_FLAGS "/showIncludes")
		Use full Paths	set_target_properties(target PROPERTIES COMPILE_FLAGS "/FC")
		Omit Default Library name	set_target_properties(target PROPERTIES COMPILE_FLAGS "/ZI")
		Internal Compiler Error Reporting	set_target_properties(target PROPERTIES COMPILE_FLAGS "/errorReport:queue") set_target_properties(target PROPERTIES COMPILE_FLAGS "/errorReport:none") set_target_properties(target PROPERTIES COMPILE_FLAGS "/errorReport:prompt") set_target_properties(target PROPERTIES COMPILE_FLAGS "/errorReport:send")
		Treat Specific Warnings as Errors	Don't know
Linker	General	Output File	#normal case set_target_properties(target PROPERTIES OUTPUT_NAME "Helloworld") set_target_properties(target PROPERTIES

		<pre>PREFIX "lib") set_target_properties(target PROPERTIES SUFFIX "lib") #for debug version set_target_properties(target PROPERTIES DEBUG_OUTPUT_NAME "Helloworld") set_target_properties(target PROPERTIES DEBUG_PREFIX "lib") set_target_properties(target PROPERTIES DEBUG_SUFFIX "lib") #For dlls set_target_properties(target PROPERTIES OUTPUT_NAME "Helloworld") set_target_properties(target PROPERTIES IMPORT_PREFIX "lib") set_target_properties(target PROPERTIES IMPORT_SUFFIX "lib") set_target_properties(target PROPERTIES PREFIX "bin") set_target_properties(target PROPERTIES SUFFIX "dll") #output path</pre>
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		Show Progress	set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE") set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE:Lib") set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE:ICF") set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE:REF") set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE:SAFESEH") set_target_properties(target PROPERTIES LINK_FLAGS "/VERBOSE:CLR") #not setting means no
		Version	set_target_properties(target PROPERTIES VERSION 0.1.2.3)
		Enable Incremental Linking	set_target_properties(target PROPERTIES LINK_FLAGS "/INCREMENTAL") set_target_properties(target PROPERTIES LINK_FLAGS "/INCREMENTAL:NO") set(CMAKE_EXE_LINKER_FLAGS_DEBUG "/INCREMENTAL") set(CMAKE_EXE_LINKER_FLAGS_DEBUG "/INCREMENTAL:NO")

		Suppress Startup Banner	<code>set_target_properties(target PROPERTIES LINK_FLAGS "/NOLOGO")</code>
		Ignore Import Library	Don't know
		Register Output	Don't know
		Per-user Redirection	Don't know
		Additional Library Directories	<code>link_directories(dir1 dir2)</code> <code>set_target_properties(target PROPERTIES LINK_FLAGS "/LIBPATH:dir1 /LIBPATH:dir2")</code>
		Link Library Dependencies	Don't know
		Use Library Dependency Inputs	Don't know
		Link Status	<code>set_target_properties(target PROPERTIES LINK_FLAGS "/LTCG:STATUS")</code> <code>set_target_properties(target PROPERTIES LINK_FLAGS "/LTCG:NOSTATUS")</code>

		Prevent DLL Binding	<pre>set_target_properties(target PROPERTIES LINK_FLAGS "/ALLOWBIND:NO") set_target_properties(target PROPERTIES LINK_FLAGS "/ALLOWBIND:YES")</pre>
		Treat Linker Warnings As Errors	<pre>set_target_properties(target PROPERTIES LINK_FLAGS "/WX")</pre>
		Force File Output	<pre>set_target_properties(target PROPERTIES LINK_FLAGS "/FORCE")</pre>
		Create Hot Patchable Image	<pre>set_target_properties(target PROPERTIES LINK_FLAGS "/FUNCTIONPADMIN") set_target_properties(target PROPERTIES LINK_FLAGS "/FUNCTIONPADMIN:16") #Itanium only set_target_properties(target PROPERTIES LINK_FLAGS "/FUNCTIONPADMIN:6") #x64 only set_target_properties(target PROPERTIES LINK_FLAGS "/FUNCTIONPADMIN:5") #x86 only</pre>
		Specify Section Attributes	Don't know

	Input	Additional Dependancies	target_link_libraries(target item1 item2)
		Ignore All Default Libraries	set_target_properties(target PROPERTIES LINK_FLAGS "/NODEFAULTLIB")
Put files into folders			source_group(header FILES includeme.h)

结论：CMAKE 默认会修改的选项有时候是没有办法再次修改的。CMAKE 默认不修改的选项大部分情况都可以自己定义。