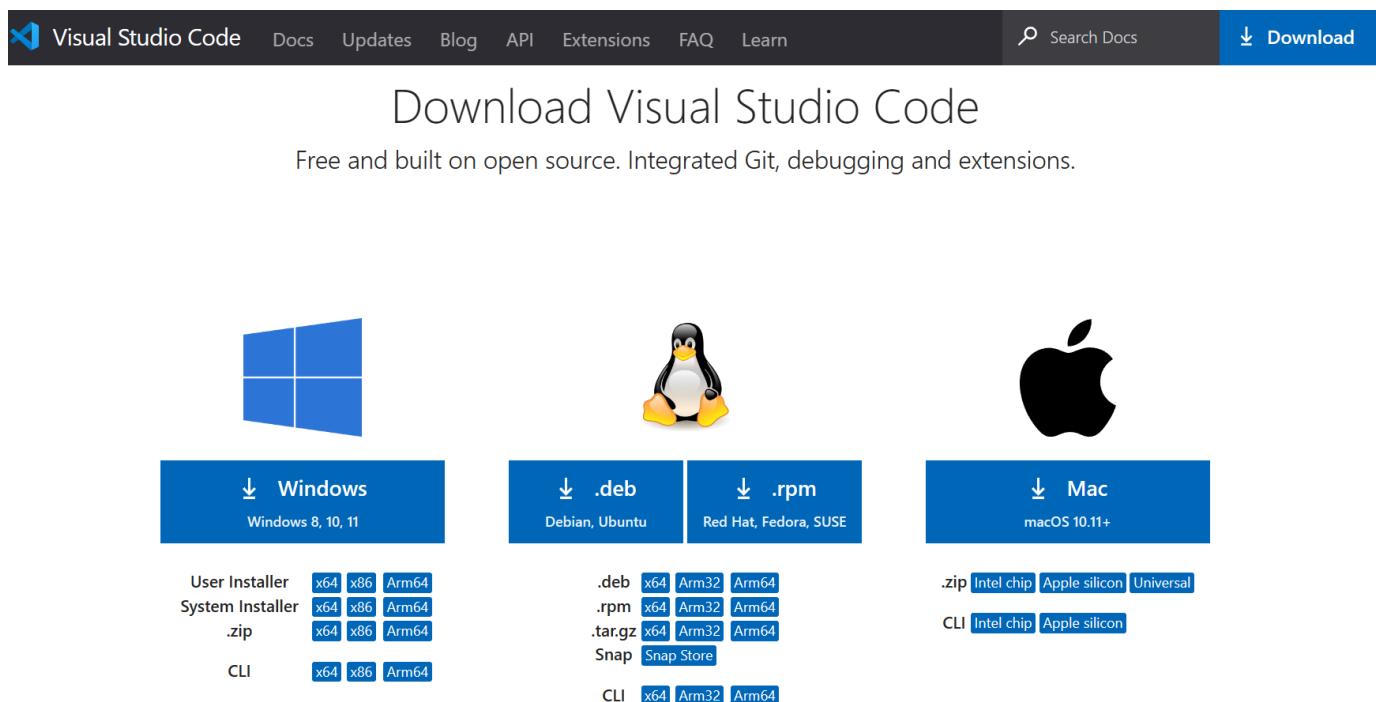


A. 前置作業：

1. 至官網安裝 win10 版本的 Visual Studio Code ([Download Visual Studio Code - Mac, Linux, Windows](#))



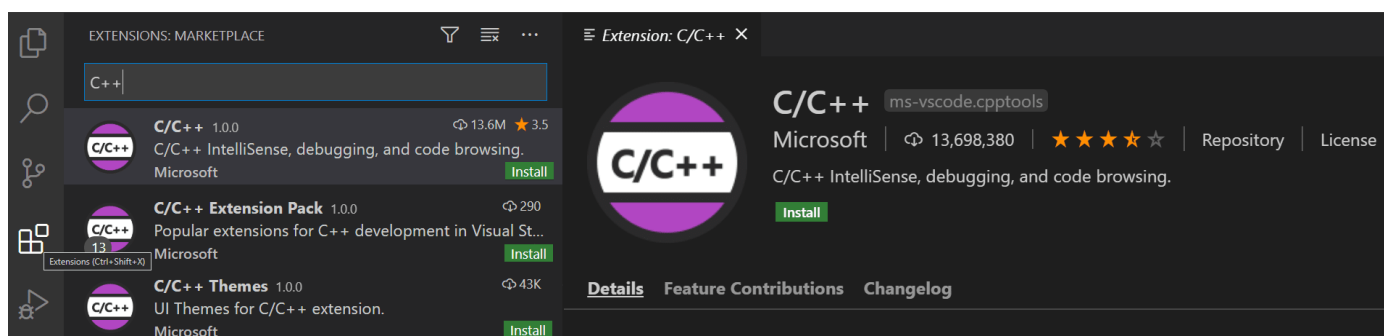
The image shows the Visual Studio Code download page. At the top, there's a navigation bar with links like 'Visual Studio Code', 'Docs', 'Updates', 'Blog', 'API', 'Extensions', 'FAQ', 'Learn', and a 'Search Docs' field. A 'Download' button is on the right. The main heading is 'Download Visual Studio Code' with the tagline 'Free and built on open source. Integrated Git, debugging and extensions.' Below this, there are three main sections for different operating systems: Windows, Linux, and Mac. Each section has a download button and a list of available installers. For Windows, there are buttons for 'User Installer', 'System Installer', '.zip', and 'CLI', each with sub-options for 'x64', 'x86', and 'Arm64'. For Linux, there are buttons for '.deb' (Debian, Ubuntu) and '.rpm' (Red Hat, Fedora, SUSE), with sub-options for 'x64', 'Arm32', and 'Arm64'. For Mac, there are buttons for '.zip' and 'CLI', with sub-options for 'Intel chip', 'Apple silicon', and 'Universal'.

2. 依說明安裝 Mingw-w64 (<https://code.visualstudio.com/docs/cpp/config-mingw>)



The image shows a screenshot of the Visual Studio Code documentation page titled 'Using GCC with MinGW'. The page has a sidebar on the left with a table of contents including 'Overview', 'SETUP', 'GET STARTED', 'USER GUIDE', 'SOURCE CONTROL', 'TERMINAL', 'LANGUAGES', 'NODEJS / JAVASCRIPT', 'TYPESCRIPT', 'PYTHON', 'JAVA', and 'C++'. The main content area starts with an 'Edit' button. The article text explains that the tutorial is for configuring Visual Studio Code to use the GCC C++ compiler (g++) and GDB debugger from mingw-w64 to create programs that run on Windows. It mentions that after configuration, users can compile and debug a simple Hello World program. It also notes that the tutorial does not teach about GCC, GDB, Mingw-w64, or the C++ language, and that there are many good resources available on the Web. A link to the 'VS Code documentation repository' is provided. The 'Prerequisites' section states that to successfully complete the tutorial, users must do the following steps: 1. Install Visual Studio Code. 2. Install the C/C++ extension for VS Code. It explains that the C/C++ extension can be installed by searching for 'c++' in the Extensions view (Ctrl+Shift+X). On the right side, there is a section titled 'IN THIS ARTICLE' with a list of links: 'Prerequisites', 'Create Hello World', 'Explore IntelliSense', 'Run helloworld.cpp', 'Debug helloworld.cpp', 'Explore the debugger', 'Step through the code', 'Set a watch', 'Customize debugging with launch.json', 'C/C++ configurations', 'Troubleshooting', and 'Next steps'. At the bottom right, there are social media links: 'Tweet this link', 'Subscribe', 'Ask questions', 'Follow @code', and 'Request feature'.

- 打開 Visual Studio Code 安裝 C/C++ extension



The image shows a screenshot of the Visual Studio Code Extensions Marketplace. The search bar at the top contains 'C++'. The search results show several extensions, with the first one being 'C/C++ 1.0.0' by Microsoft. This extension is highlighted, and its details are shown on the right. The details include the extension's icon, name, publisher (Microsoft), version (1.0.0), download count (13.6M), and star rating (3.5). It also shows the extension's description: 'C/C++ IntelliSense, debugging, and code browsing.' Below the description, there are buttons for 'Install' and 'Details'. The 'Details' button is selected, and the details page is shown. The details page includes the extension's icon, name, publisher (Microsoft), version (1.0.0), download count (13,698,380), and star rating (4.5). It also shows the extension's description: 'C/C++ IntelliSense, debugging, and code browsing.' Below the description, there are buttons for 'Install', 'Details', 'Feature Contributions', and 'Changelog'.

● 下載 MSYS2 並透過 MSYS2 安裝 Mingw-w64 工具鏈

```
User@DESKTOP-VDIT4R9 UCRT64 ~
$ pacman -S mingw-w64-ucrt-x86_64-gcc
resolving dependencies...
looking for conflicting packages...

Packages (15) mingw-w64-ucrt-x86_64-binutils-2.40-2
               mingw-w64-ucrt-x86_64-crt-git-10.0.0.r234.g283e5b23a-1
               mingw-w64-ucrt-x86_64-gcc-libs-12.2.0-10 mingw-w64-ucrt-x86_64-gmp-6.2.1-5
               mingw-w64-ucrt-x86_64-headers-git-10.0.0.r234.g283e5b23a-1
               mingw-w64-ucrt-x86_64-isl-0.25-1 mingw-w64-ucrt-x86_64-libiconv-1.17-3
               mingw-w64-ucrt-x86_64-libwinpthread-git-10.0.0.r234.g283e5b23a-1
               mingw-w64-ucrt-x86_64-mpc-1.3.1-1 mingw-w64-ucrt-x86_64-mpfr-4.2.0-1
               mingw-w64-ucrt-x86_64-windows-default-manifest-6.4-4
               mingw-w64-ucrt-x86_64-winpthreads-git-10.0.0.r234.g283e5b23a-1
               mingw-w64-ucrt-x86_64-zlib-1.2.13-3 mingw-w64-ucrt-x86_64-zstd-1.5.4-1
               mingw-w64-ucrt-x86_64-gcc-12.2.0-10

Total Download Size: 47.83 MiB
Total Installed Size: 402.51 MiB

:: Proceed with installation? [Y/n] Y
:: Retrieving packages...
mingw-w64-ucrt-x86_64-isl-... 1386.1 KiB 288 KiB/s 00:05 [#####] 100%
mingw-w64-ucrt-x86_64-crt-... 3.3 MiB 480 KiB/s 00:07 [#####] 100%
mingw-w64-ucrt-x86_64-gcc-... 877.3 KiB 208 KiB/s 00:04 [#####] 100%
mingw-w64-ucrt-x86_64-binu... 6.1 MiB 635 KiB/s 00:10 [#####] 100%
mingw-w64-ucrt-x86_64-head... 5.7 MiB 569 KiB/s 00:10 [#####] 100%
mingw-w64-ucrt-x86_64-libi... 719.9 KiB 395 KiB/s 00:02 [#####] 100%
mingw-w64-ucrt-x86_64-zstd... 612.7 KiB 487 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-gmp-... 571.2 KiB 623 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-mpc-... 104.2 KiB 161 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-mpfr... 430.2 KiB 351 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-zlib... 91.8 KiB 76.4 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-winp... 40.0 KiB 37.7 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-libw... 29.9 KiB 25.8 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-wind... 3.0 KiB 5.00 KiB/s 00:01 [#####] 100%
mingw-w64-ucrt-x86_64-gcc-... 28.0 MiB 1457 KiB/s 00:20 [#####] 100%
Total (15/15) 47.8 MiB 2.29 MiB/s 00:21 [#####] 100%
(15/15) checking keys in keyring [#####] 100%
(15/15) checking package integrity [#####] 100%
(15/15) loading package files [#####] 100%
(15/15) checking for file conflicts [#####] 100%
(15/15) checking available disk space [#####] 100%
:: Processing package changes...
(1/15) installing mingw-w64-ucrt-x86_64-libwinpthread-git [#####] 100%
(2/15) installing mingw-w64-ucrt-x86_64-gcc-libs [#####] 100%
(3/15) installing mingw-w64-ucrt-x86_64-zstd [#####] 100%
(4/15) installing mingw-w64-ucrt-x86_64-binutils [#####] 100%
(5/15) installing mingw-w64-ucrt-x86_64-headers-git [#####] 100%
(6/15) installing mingw-w64-ucrt-x86_64-crt-git [#####] 100%
(7/15) installing mingw-w64-ucrt-x86_64-gmp [#####] 100%
(8/15) installing mingw-w64-ucrt-x86_64-isl [#####] 100%
(9/15) installing mingw-w64-ucrt-x86_64-libiconv [#####] 100%
(10/15) installing mingw-w64-ucrt-x86_64-mpfr [#####] 100%
(11/15) installing mingw-w64-ucrt-x86_64-mpc [#####] 100%
(12/15) installing mingw-w64-ucrt-x86_64-windows-default... [#####] 100%
(13/15) installing mingw-w64-ucrt-x86_64-winpthreads-git [#####] 100%
(14/15) installing mingw-w64-ucrt-x86_64-zlib [#####] 100%
(15/15) installing mingw-w64-ucrt-x86_64-gcc [#####] 100%

User@DESKTOP-VDIT4R9 UCRT64 ~
$ gcc --version
gcc.exe (Rev10, Built by MSYS2 project) 12.2.0
Copyright (C) 2022 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

```

User@DESKTOP-VDIT4R9 UCRT64 ~
$ pacman -S --needed base-devel mingw-w64-x86_64-toolchain
:: There are 19 members in group mingw-w64-x86_64-toolchain:
:: Repository mingw64
 1) mingw-w64-x86_64-binutils  2) mingw-w64-x86_64-crt-git  3) mingw-w64-x86_64-gcc
 4) mingw-w64-x86_64-gcc-ada  5) mingw-w64-x86_64-gcc-fortran
 6) mingw-w64-x86_64-gcc-libgfortran  7) mingw-w64-x86_64-gcc-libs  8) mingw-w64-x86_64-gcc-objc
 9) mingw-w64-x86_64-gdb  10) mingw-w64-x86_64-gdb-multiarch  11) mingw-w64-x86_64-headers-git
12) mingw-w64-x86_64-libgccjit  13) mingw-w64-x86_64-libmangle-git
14) mingw-w64-x86_64-libwinpthread-git  15) mingw-w64-x86_64-make  16) mingw-w64-x86_64-pkgconf
17) mingw-w64-x86_64-tools-git  18) mingw-w64-x86_64-winpthread-git
19) mingw-w64-x86_64-winstorecompat-git

Enter a selection (default=all): default
error: invalid number: default

Enter a selection (default=all): 按下 Enter 鍵即可!
resolving dependencies...
looking for conflicting packages...

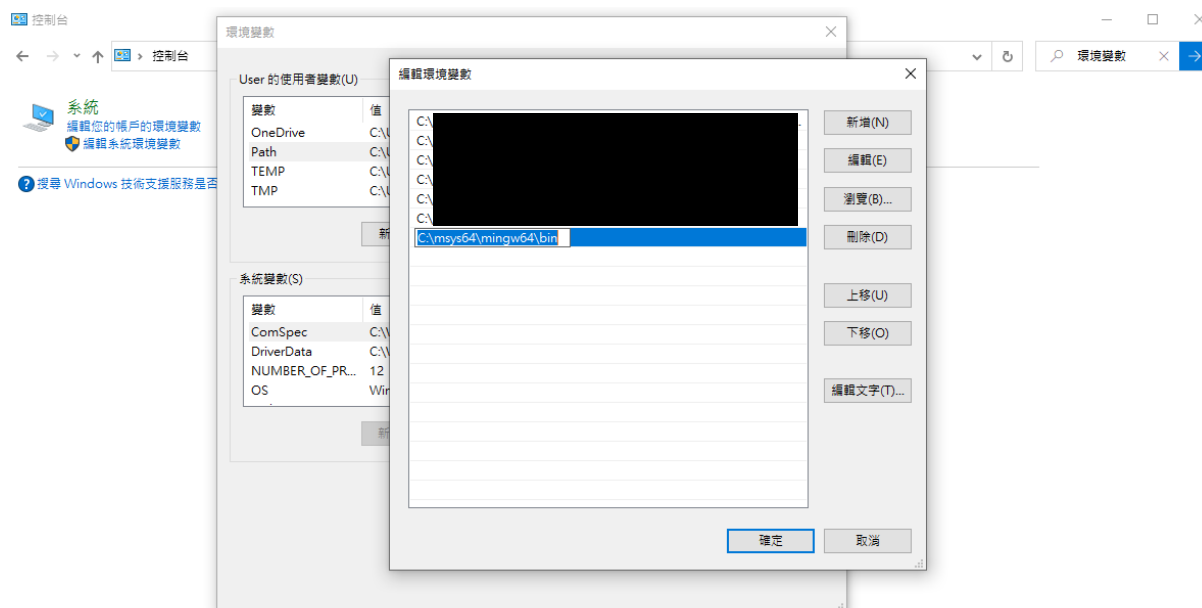
Packages (58) binutils-2.40-1 bison-3.8.2-4 diffstat-1.65-1 diffutils-3.9-1 dos2unix-7.4.4-1
flex-2.6.4-3 m4-1.4.19-2 make-4.4.1-1 mingw-w64-x86_64-bzip2-1.0.8-2
mingw-w64-x86_64-expat-2.5.0-1 mingw-w64-x86_64-gettext-0.21.1-1
mingw-w64-x86_64-gmp-6.2.1-5 mingw-w64-x86_64-is1-0.25-1
mingw-w64-x86_64-libffi-3.4.4-1 mingw-w64-x86_64-libiconv-1.17-3
mingw-w64-x86_64-libsystre-1.0.1-4 mingw-w64-x86_64-libtre-git-r128.6fb7206-2
mingw-w64-x86_64-mpc-1.3.1-1 mingw-w64-x86_64-mpdecimal-2.5.1-1
mingw-w64-x86_64-mpfr-4.2.0-1 mingw-w64-x86_64-ncurses-6.4.20230211-1
mingw-w64-x86_64-openssl-3.1.0-1 mingw-w64-x86_64-python-3.10.10-1
mingw-w64-x86_64-readline-8.2.001-6 mingw-w64-x86_64-sqlite3-3.41.1-1
mingw-w64-x86_64-tcl-8.6.12-1 mingw-w64-x86_64-termcap-1.3.1-6
mingw-w64-x86_64-tk-8.6.12-1 mingw-w64-x86_64-tzdata-2022g-1
mingw-w64-x86_64-windows-default-manifest-6.4-4 mingw-w64-x86_64-xxhash-0.8.1-2
mingw-w64-x86_64-xz-5.4.1-1 mingw-w64-x86_64-zlib-1.2.13-3
mingw-w64-x86_64-zstd-1.5.4-1 patch-2.7.6-2 pkgconf-1.9.4-1 texinfo-7.0.2-1
texinfo-tex-7.0.2-1 base-devel-2022.12-2 mingw-w64-x86_64-binutils-2.40-2
mingw-w64-x86_64-crt-git-10.0.0.r234.g283e5b23a-1 mingw-w64-x86_64-gcc-12.2.0-10
mingw-w64-x86_64-gcc-ada-12.2.0-10 mingw-w64-x86_64-gcc-fortran-12.2.0-10
mingw-w64-x86_64-gcc-libgfortran-12.2.0-10 mingw-w64-x86_64-gcc-libs-12.2.0-10
mingw-w64-x86_64-gcc-objc-12.2.0-10 mingw-w64-x86_64-gdb-13.1-3
mingw-w64-x86_64-gdb-multiarch-13.1-3
mingw-w64-x86_64-headers-git-10.0.0.r234.g283e5b23a-1
mingw-w64-x86_64-libgccjit-12.2.0-10
mingw-w64-x86_64-libmangle-git-10.0.0.r234.g283e5b23a-1
mingw-w64-x86_64-libwinpthread-git-10.0.0.r234.g283e5b23a-1
mingw-w64-x86_64-make-4.4-2 mingw-w64-x86_64-pkgconf-1~1.8.0-2
mingw-w64-x86_64-tools-git-10.0.0.r234.g283e5b23a-1
mingw-w64-x86_64-winpthread-git-10.0.0.r234.g283e5b23a-1
mingw-w64-x86_64-winstorecompat-git-10.0.0.r234.g283e5b23a-1

Total Download Size: 162.50 MiB
Total Installed Size: 1029.15 MiB

:: Proceed with installation? [Y/n] Y

```

- 打開控制台—編輯您的帳戶的環境變數—點擊 Path—新增 Mingw-w64 目標檔案夾路徑(應為 C:\msys64\mingw64\bin)



3. 打開命令提示字元，依序輸入 gcc --version、g++ --version、gdb --version 確認安裝成功

命令提示字元

```
Microsoft Windows [版本 10.0.18363.1556]
(c) 2019 Microsoft Corporation. 著作權所有，並保留一切權利。

C:\Users\User>gcc --version
gcc (Rev10, Built by MSYS2 project) 12.2.0
Copyright (C) 2022 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

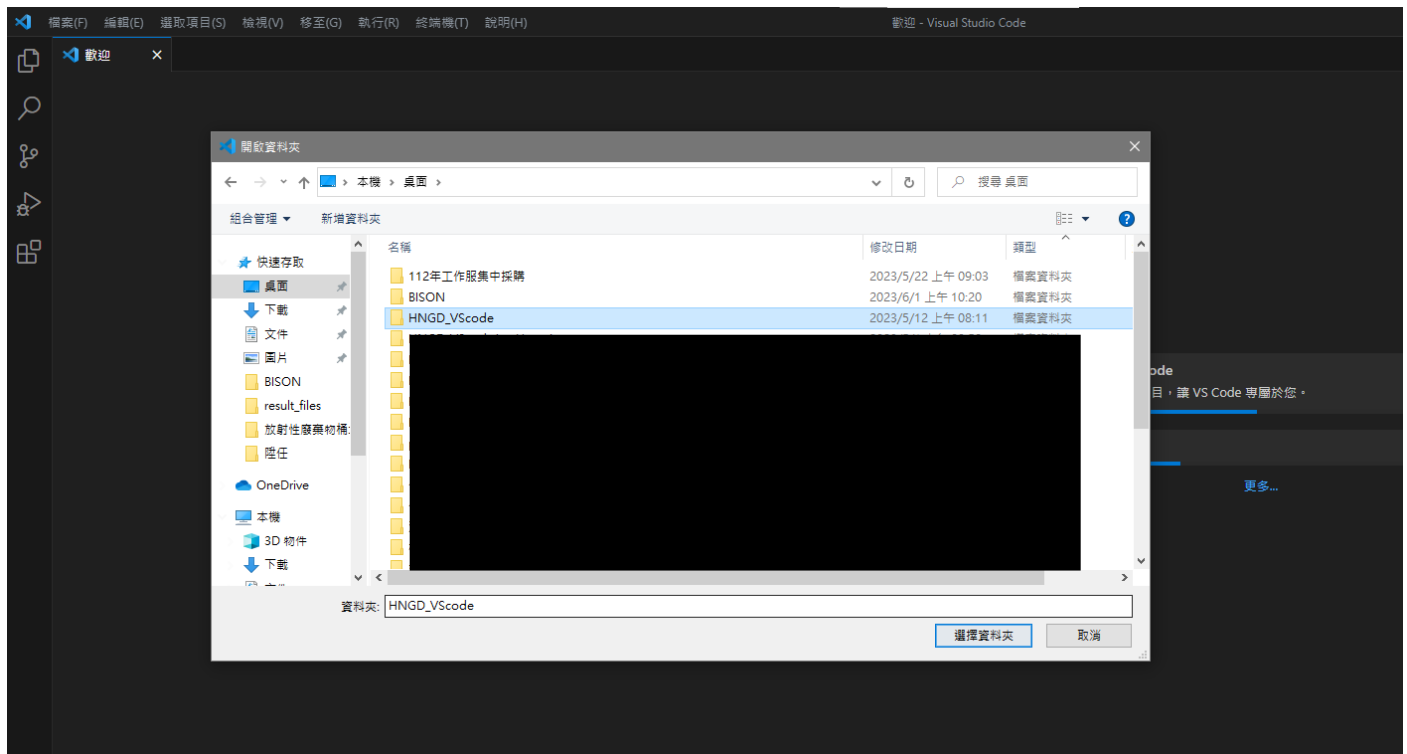
C:\Users\User>g++ --version
g++ (Rev10, Built by MSYS2 project) 12.2.0
Copyright (C) 2022 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

C:\Users\User>gdb --version
GNU gdb (GDB) 13.1
Copyright (C) 2023 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.

C:\Users\User>
```

B. 使用步驟

1. 在 Visual Studio Code 中開啟從 github.com 下載的 HNGD_VScode 資料夾



2. 若想在模擬結束後播放提示音效，下載 VideoLAN (<https://www.videolan.org/vlc/>) 並在 Path 新增其路徑 (播放提示音效非必要，可直接 Ctrl + / 註解掉這行 `system("C:/Program Files (x86)/VideoLAN/VLC/vlc.exe" " C:\\Users\\i1392\\Desktop\\HNGD_VScode\\notif.mp3");`)



VideoLAN ▾ VLC ▾ 專案 ▾ 貢獻 ▾ 支援

VideoLAN, 既是一個專案，也是一個 非營利組織。



VLC media player

VLC 是一個自由和開源的跨平台多媒體播放器和框架，可以播放大多數多媒體檔案，以及 DVD、音樂CD、VCD 和各種串流協定。

下載 VLC ▾

Version 3.0.18 • Windows 64bit • 40 MB
175,113,901 次下載



VLC media player 安裝

選取安裝位置
選取 VLC media player 要安裝的資料夾。

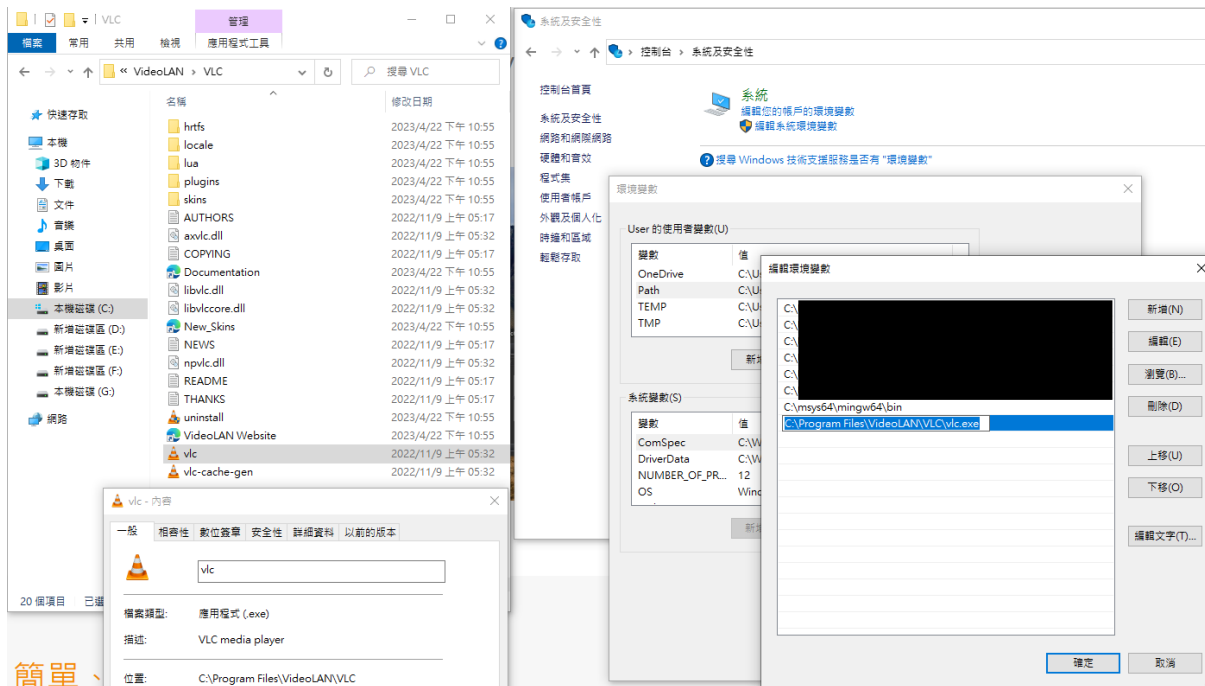
安裝程式會將 VLC media player 安裝在以下資料夾。要安裝到不同的資料夾，按「瀏覽(B)...」並選擇其他資料夾。按「安裝(I)」開始安裝。

目標資料夾

所需空間: 179.4 MB
可用空間: 40.9 GB

YateoLAN VLC media player

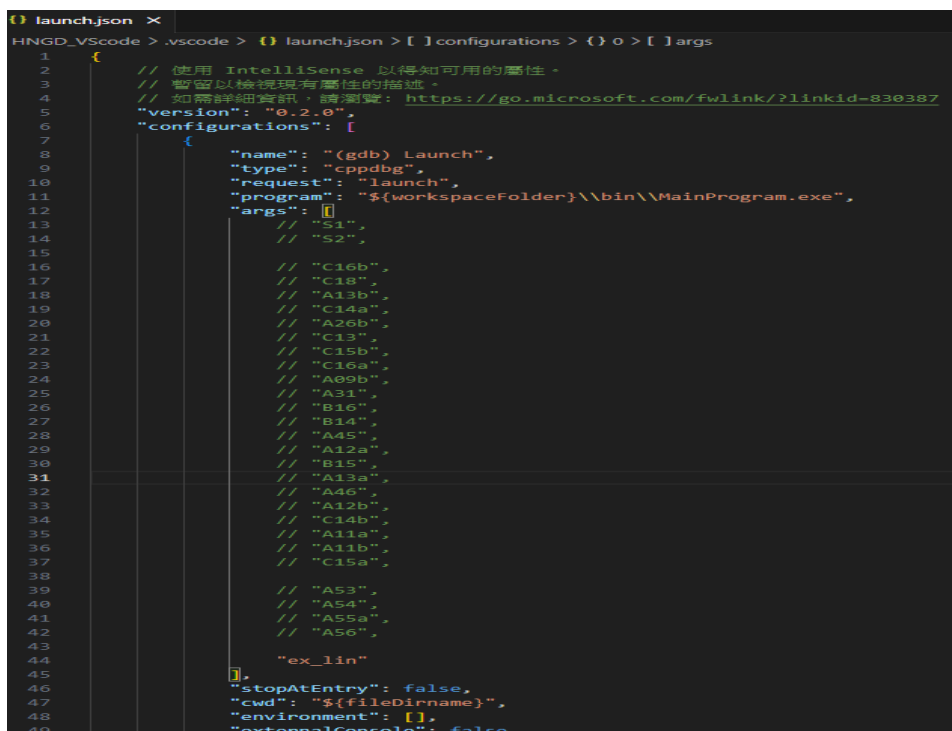
< 上一步(B) 安裝(I) 取消



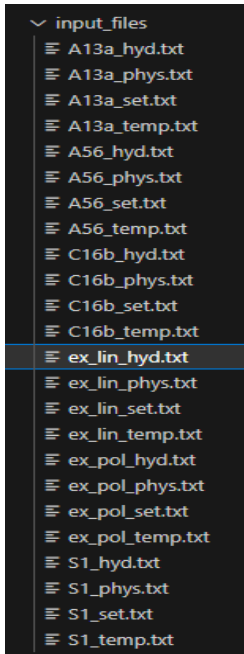
3. 在 MainProgram.C 中搜尋 /*custom*/以調整必要的設定(請參考 Florian Passelaigue 的 [README.pdf](#) 說明)



4. 從 launch.json 設定欲模擬的實驗名稱(如 C16b，請解除 C16b 這行的註解，預設為 ex_lin)



5. 確認 input_files 檔案夾有 C16b_set.txt(設定參數)、C16b_phys.txt (物理參數)、C16b_temp.txt (熱處理歷程)、C16b_hyd.txt (初始氫分佈)



6. 按下 debug 鍵(偵錯 C/C++ 檔案)進行模擬



7. 模擬結束後 result_files 資料夾將出現 C16b_input_check.txt(快速查看實驗資訊)、C16b_out.csv(結果檔)

