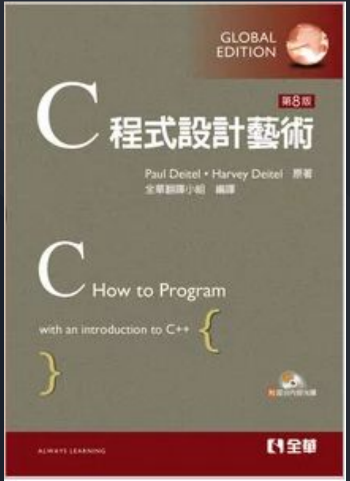
基礎程式設計
C How to Program
Introduction


GLOBAL
EDITION
第8版
C 程式設計藝術
Paul Deitel • Harvey Deitel 原著
全華翻譯小組 編譯
C How to Program
with an introduction to C++
ALWAYS LEARNING
全華

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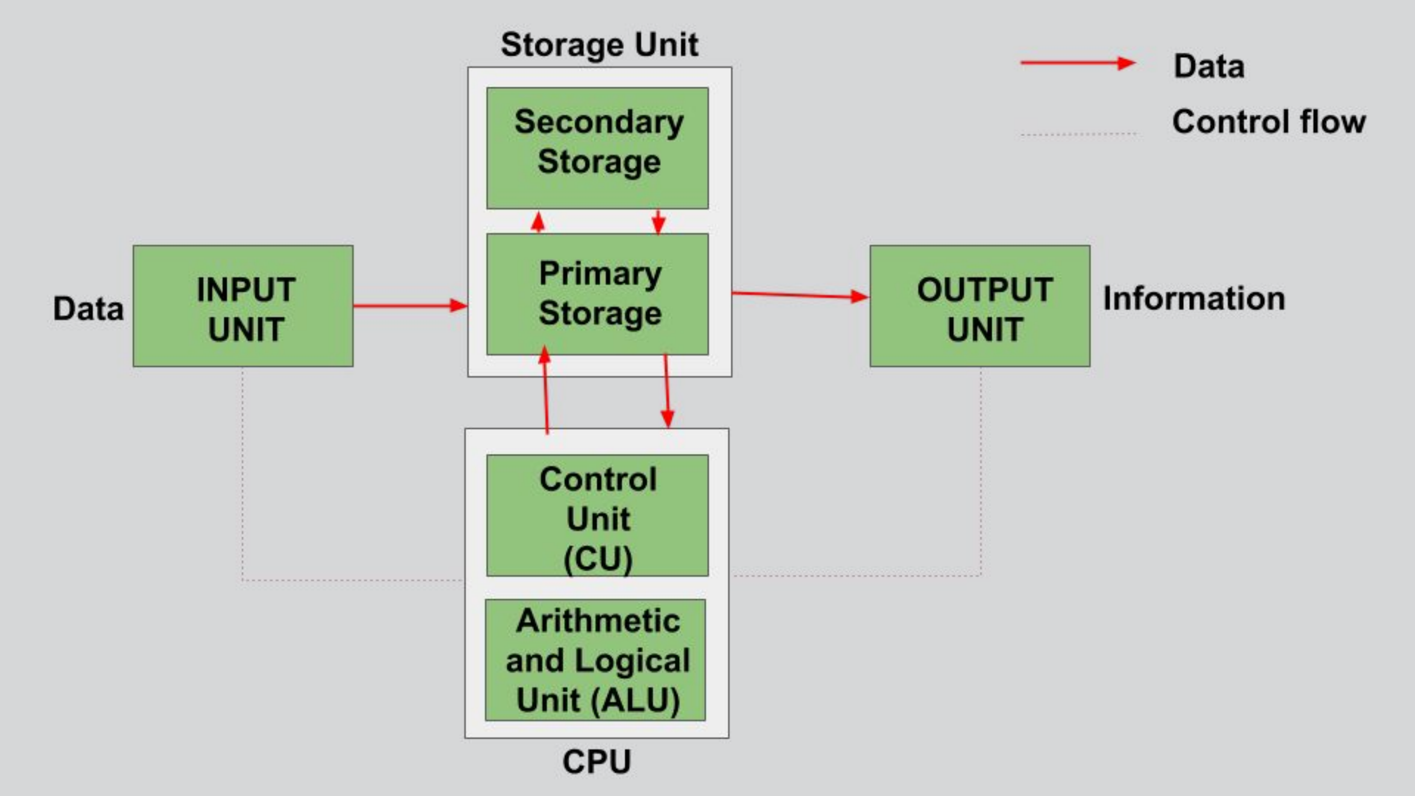
iSchool, Feng Chia University
Aug. 15, 2021

Introduction

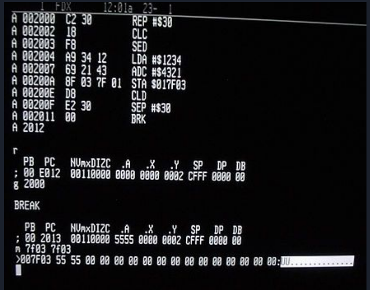
- 電腦 (通常稱作**硬體**, hardware) 由**軟體** (software) 所控制 [軟體就是人撰寫的指令，可讓電腦執行**動作** (action) 並做**判斷** (decision)]
- 電腦透過電腦程式 (computer programs) 的一組指令控制來處理資料 (data)
- 電腦程式設計者 (computer programmers)設計出電腦程式指揮電腦去執行一連串有次序的動作，這些在電腦上執行的程式稱為軟體 (software)
- **摩爾定律**(Moore's Law)
  - 提出此定律的人—Intel的共同創辦人Gordon Moore來命名。
  - 數十年來，硬體的價格一再地快速滑落，每隔一兩年，電腦運算能力會增加近一倍，且仍廉價

電腦的架構


Storage Unit
Secondary Storage
Primary Storage
Data
Control flow
Data
INPUT UNIT
OUTPUT UNIT
Information
Control Unit (CU)
Arithmetic and Logical Unit (ALU)
CPU

程式語言

- 機器語言
  - 由於硬體架構的定義，任何的電腦僅能直接瞭解其自身的**機器語言**（**machine language**）
  - 機器語言一般來說是以數字組成（最後簡化成 0 與 1）



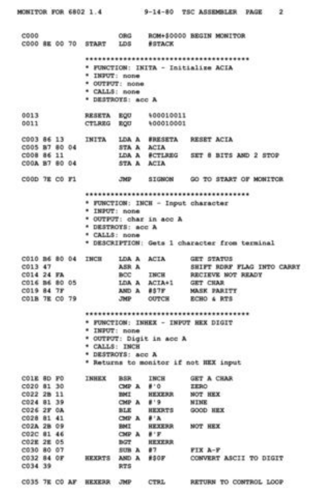
```
  1  FDX      12:01a  23-  1
A 002000  C2 30       REP #$30
A 002002  18          CLC
A 002003  F8          SED
A 002004  A9 34 12    LDA #$1234
A 002007  69 21 43    ADC #$4321
A 00200A  8F 03 7F 01 STA $017F03
A 00200E  D8          CLD
A 00200F  E2 30       SEP #$30
A 002011  00          BRK
A 2012

r
  PB  PC   NVmxDIZC  .A   .X   .Y   SP   DP  DB
; 00 E012  00110000 0000 0000 0002 CFFF 0000 00
g 2000

BREAK

  PB  PC   NVmxDIZC  .A   .X   .Y   SP   DP  DB
; 00 2013  00110000 5555 0000 0002 CFFF 0000 00
m 7f03 7f03
>007F03 55 55 00 00 00 00 00 00 00 00 00 00 00 00 00 00:UU..............
```

- 組合語言
  - 編寫機器語言對多數的程式設計師是非常慢且枯燥
  - 使用類似英語的縮寫來表達基本運算元，這些縮寫字構成**組合語言**（**assembly languages**）的基礎。名為**組譯器**（**assembler**）的**轉譯程式**（**translator program**）可將組合語言轉成**機器語言**
  - 雖然人類對這種程式碼較清楚易懂，但要電腦能執行還是要轉譯成**機器語言**



```
MONITOR FOR 6802 1.4          9-14-80  TSC ASSEMBLER  PAGE    2

 C000                 ORG    ROM+$0000 BEGIN MONITOR
 C000 8E 00 70  START  LDS    #STACK

                ***************************************
                * FUNCTION: INITA - Initialize ACIA
                * INPUT: none
                * OUTPUT: none
                * CALLS: none
                * DESTROYS: acc A

 0013           RESETA EQU    %00010011
 0011           CTLREG EQU    %00010001

 C003 86 13     INITA  LDA A  #RESETA   RESET ACIA
 C005 B7 80 04         STA A  ACIA
 C008 86 11            LDA A  #CTLREG   SET 8 BITS AND 2 STOP
 C00A B7 80 04         STA A  ACIA

 C00D 7E C0 F1         JMP    SIGNON    GO TO START OF MONITOR

                ***************************************
                * FUNCTION: INCH - Input character
                * INPUT: none
                * OUTPUT: char in acc A
                * DESTROYS: acc A
                * CALLS: none
                * DESCRIPTION: Gets 1 character from terminal

 C010 B6 80 04  INCH   LDA A  ACIA      GET STATUS
 C013 47               ASR A            SHIFT RDRF FLAG INTO CARRY
 C014 24 FA            BCC    INCH      RECIEVE NOT READY
 C016 B6 80 05         LDA A  ACIA+1    GET CHAR
 C019 84 7F            AND A  #$7F      MASK PARITY
 C01B 7E C0 79         JMP    OUTCH     ECHO & RTS

                ***************************************
                * FUNCTION: INHEX - INPUT HEX DIGIT
                * INPUT: none
                * OUTPUT: Digit in acc A
                * CALLS: INCH
                * DESTROYS: acc A
                * Returns to monitor if not HEX input

 C01E 8D F0     INHEX  BSR    INCH      GET A CHAR
 C020 81 30            CMP A  #'0       ZERO
 C022 2B 11            BMI    HEXERR    NOT HEX
 C024 81 39            CMP A  #'9       NINE
 C026 2F 0A            BLE    HEXRTS    GOOD HEX
 C028 81 41            CMP A  #'A
 C02A 2B 09            BMI    HEXERR    NOT HEX
 C02C 81 46            CMP A  #'F
 C02E 2E 05            BGT    HEXERR
 C030 80 07            SUB A  #7        FIX A-F
 C032 84 0F     HEXRTS AND A  #$0F      CONVERT ASCII TO DIGIT
 C034 39               RTS

 C035 7E C0 AF  HEXERR JMP    CTRL      RETURN TO CONTROL LOOP
```

程式語言 (cont.)

- **高階語言**
    - 為了加快程式設計的過程，於是發展了**高階語言**(**high-level languages**)，它只需單一敘述(**statement**)就能完成不少工作
    - 可讓程式設計者以近似於日常英文用語，和一些常用的數學符號來撰寫指令
    - 名為**編譯器**(**compiler**)的轉譯程式(**translator program**)可將高階語言程式轉成機器語言，將高階語言編譯成機器語言可能要花不少時間
    - 直譯器(**Interpreter**)可直接執行高階語言程式(省去編譯所花的時間)，但執行速度比編譯好的程式要來得慢
    - **腳本語言**(**Scripting languages**)像是**JavaScript**和**PHP**是由直譯器來處理

C 程式語言

- C 是由 B 和 BCPL 這兩種語言所發展出來的
- **標準化**
    - C **語言**在各種電腦 （有時稱為**硬體平台**） 上的快速發展，並且產生了許多的版本
    - 這些版本相當類似，但是卻不相容。若程式設計者想撰寫在數種平台執行的可攜性程式，這便是個嚴重的問題
    - 因此非有**標準版的C**不可
    - 1983年，美國國家標準局(ANSI)中負責電腦和資訊處理的委員會(X3)組成了一個代號為X3J11的技術委員會，來為C語言提供明確且不受機器影響的定義

C 程式語言 (Cont.)

  - 在1989年，在美國由美國國家標準局 (American National Standards Institute, ANSI) 核可為ANSI X3.159-1989
  - 國際標準組織 (International Standards Organization, ISO) 核可為全球通行標準。簡稱為標準C語言，此標準在1999年修訂—其標準文件為INCITS/ISO/IEC 9899-1999並簡稱為 **C99**
- **新的C語言標準**
  - 新的C語言標準(或稱為**C11**)
  - 新的標準加強並延伸C語言的能力，並非常用的C語言編譯器都支援這些新的功能，在有提供C99支援的編譯器中，大都也只支援新功能的一部份

C 標準函式庫

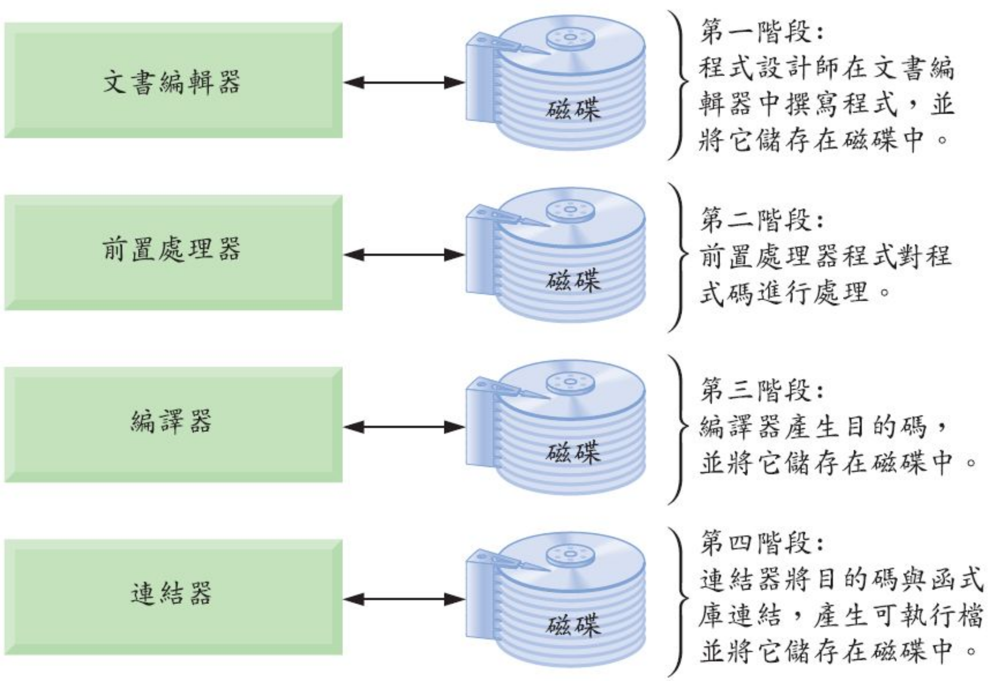
- C程式是由許多稱為函式（**functions**）的模組或是片段所構成
- 您可以自己設計所有要用到的函式，不過大多數的C程式設計師都會利用一套現成的函式，稱為C標準函式庫
- 以區塊導向編寫程式可避免重寫軟體，因此使用現有的區塊稱為**軟體再用**。當使用C語言撰寫程式，將會使用到下列構件：
    - C標準函式庫所提供的函式
    - 自己撰寫的函式
    - 其他人撰寫並提供給你使用的函式
- 自建函式優點，可以清楚瞭解其實際運作方式。**缺點**則是必須花費時間來設計、發展和偵錯新函式

C++與其他以C為基礎的語言

- C++是由貝爾實驗室的Bjarne Stroustrup所發展出來的。C++根源於C語言，而且增加了許多功能使得C語言變得更好。最重要的是它提供了**物件導向程式設計**（**object-oriented programming**）的功能
- Object-C
- Visual C#
- Java
- PHP
- Javascript

典型的C開發環境

- C系統通常由**程式開發環境**與**程式語言及C標準函式庫**部分組成
- C程式在真正執行前，通常必須經過6個階段：**編輯(edit)**、**前置處理 (preprocess)**、**編譯 (compile)**，**連結 (link)**、**載入 (load)** 和**執行 (execute)**


文書編輯器
磁碟
前置處理器
磁碟
編譯器
磁碟
連結器
磁碟

第一階段：
程式設計師在文書編輯器中撰寫程式，並將它儲存在磁碟中。

第二階段：
前置處理器程式對程式碼進行處理。

第三階段：
編譯器產生目的碼，並將它儲存在磁碟中。

第四階段：
連結器將目的碼與函式庫連結，產生可執行檔並將它儲存在磁碟中。

第一階段：程式編譯工具 GCC

- `gcc for Windows`
- `gcc for Linux`
- `gcc for Mac`

第一階段：建立程式

- 利用文書編輯器(editor program)來撰寫程式
    - Visual Studio
    - Notepad+
    - Atom
    - Sublime Text

第二階段與第三階段：前置處理與編譯C++程式

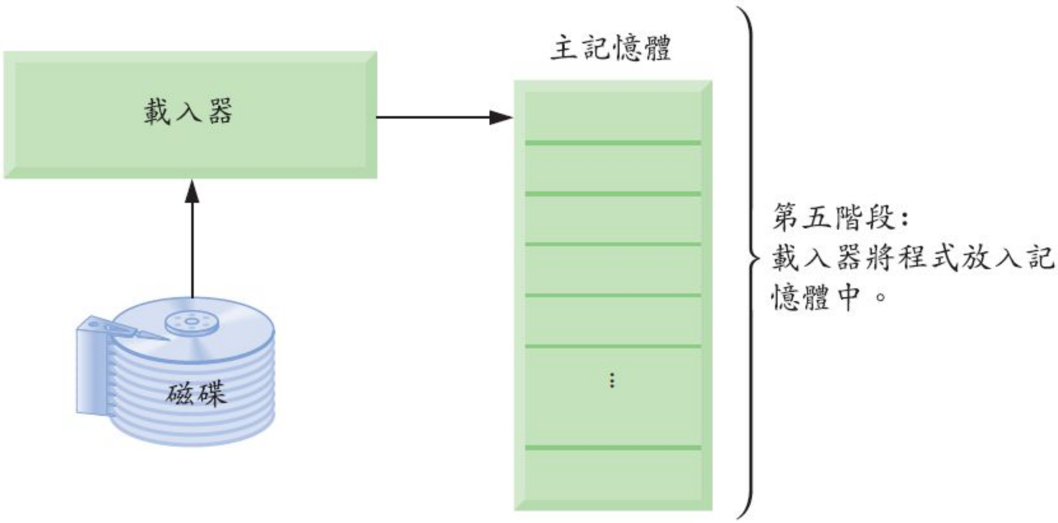
- 第二階段，程式設計者會下指令**編譯**（**compile**）程式
- 編譯器會將C程式碼轉譯成機器碼（也稱為目的碼，**object code**）
- 在C系統中，前置處理（**preprocessor**）程式會在編譯器轉譯階段之前執行
- C前置處理器（C preprocessor）會按照一種叫做「前置處理指令」(preprocessor directive）的特殊指令進行動作，該指令表示編譯前要對程式執行某些操作

第四階段：連結

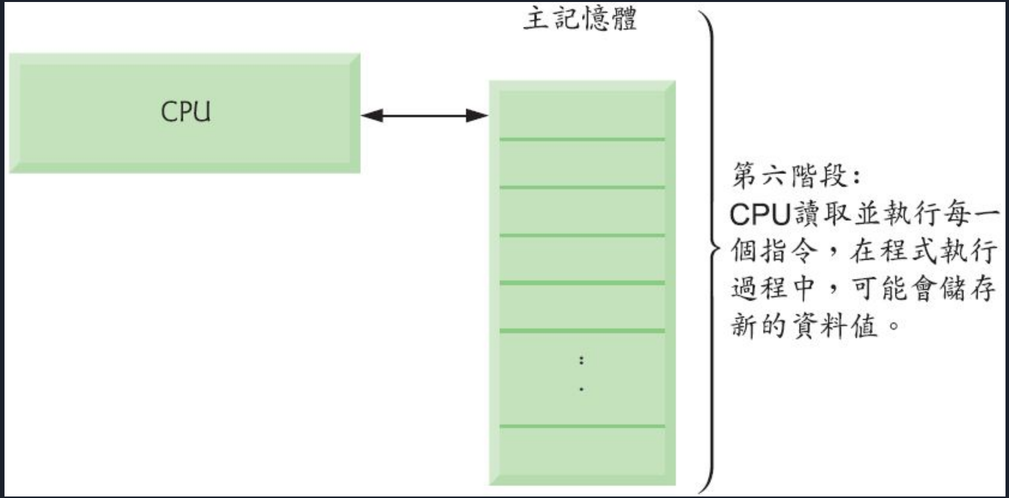
- 第四階段叫做連結（**linking**）
- C程式中，常有些參照（**reference**）會指到在別處定義的函式與資料，如標準函式庫或特定專案成員私有函式庫中的函式與資料
- 連結器（**linker**）會將目的碼與這些尚未加入的函式連接起來，以產生可執行的影像檔（**executable image**），就沒有遺漏的部分了。
- 在一般的Linux系統上，編譯及連結程式的命令是gcc（GNU C 編譯器）

第五階段：載入

- 程式執行前，必須先被放入記憶體中。載入器 (`loader`) 負責這項工作，它能把可執行的影像檔從磁碟搬到記憶體中。程式所用到的共享函式庫中其它元件，也須一併載入



第五階段：
載入器將程式放入記憶體中。



第六階段：
CPU讀取並執行每一個指令，在程式執行過程中，可能會儲存新的資料值。

第六階段：執行

- 程式最後，電腦會在CPU的控制下，以每次執行一個指令的方式開始執行（**executes**）程式
- 程式在第一次測試時不一定會成功
- 前面幾個階段都可能因各種錯誤而失敗
    - 例如：一個執行中程式可能會除以零　　（如同算術，在電腦中這是一個非法的運算）。這可能會使電腦顯示一段錯誤訊息。若發生這樣的情形，就要回到編輯階段做些必要修正，再繼續後面的幾個階段

標準輸入、標準輸出和標準錯誤串流

- C 中大部份程式都會輸入和/或輸出資料
- 大部分的 C 函式都從 **stdin** （標準輸入串流，standard input stream） 輸入資料
- 大部分的 C 函式都從 **stdout** （標準輸出串流，standard output stream） 輸出資料

作業系統

- 作業系統是一個提供使用者、應用程式開發者、系統管理者更方便的使用環境之軟體系統
- 作業系統提供應用程式更安全地、更有效率地以及能與其他應用程式同時(平行)執行
- 此軟體包含作業系統的主要元件部分稱作為核心 (**kernel**)
- 目前流行的桌上型作業系統為Linux、Windows和Mac OS X, 常用於智慧型手機和平板電腦受的行動式作業系統包括Google的Android、Apple的iOS(用於iPhone、iPad和iPod Touch等裝置)、BlackBerry OS以及Windows Phone7

Coding Environment

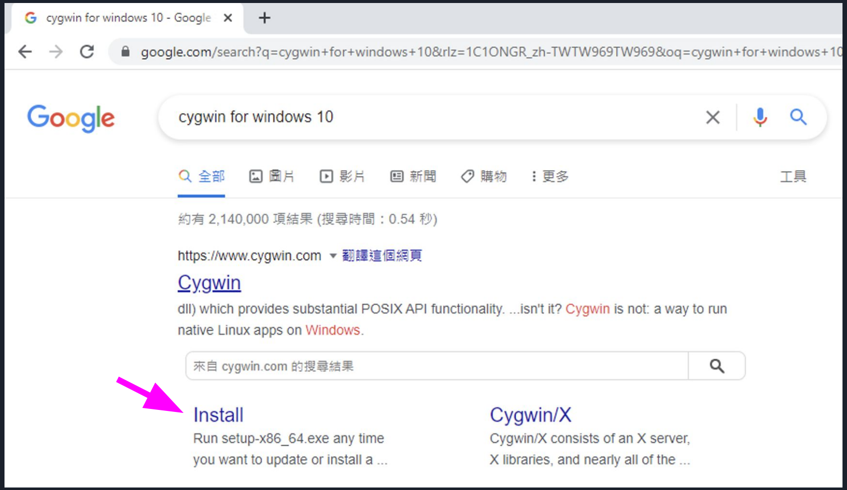
Windows 10

- Required softwares (Windows 10)
  - cygwin
  - Visual Studio Code
  - Cmder

Coding Environment

Install gcc on Windows 10

- Install the GNU gcc compiler, make, and gdb debugger


cygwin for windows 10 - Google
google.com/search?q=cygwin+for+windows+10&rlz=1C1ONGR_zh-TWTW969TW969&oq=cygwin+for+windows+10
Google
cygwin for windows 10
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更多
工具

約有 2,140,000 項結果 (搜尋時間：0.54 秒)

https://www.cygwin.com ▾ 翻譯這個網頁

Cygwin

dll) which provides substantial POSIX API functionality. ...isn't it? Cygwin is not: a way to run native Linux apps on Windows.

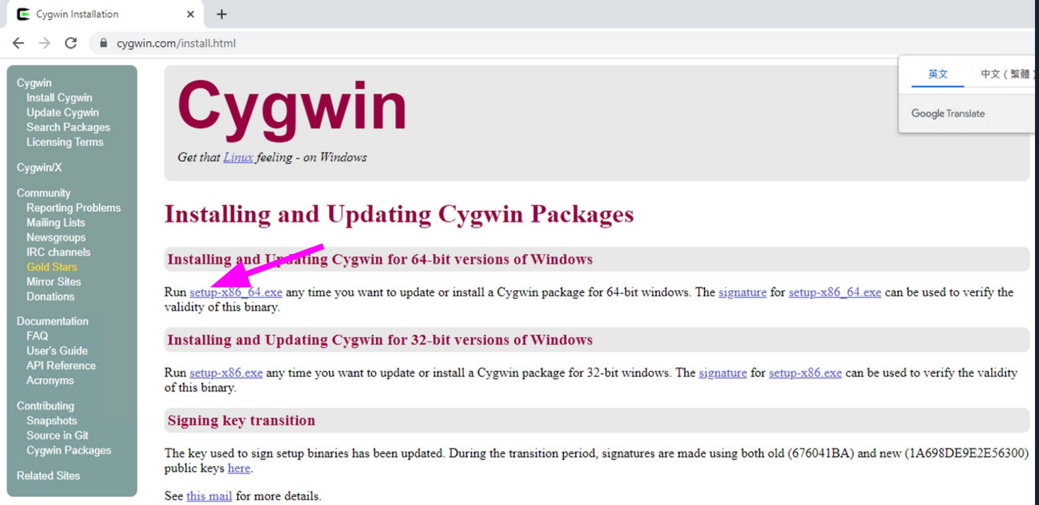
來自 cygwin.com 的搜尋結果

Install

Run setup-x86_64.exe any time you want to update or install a ...

Cygwin/X

Cygwin/X consists of an X server, X libraries, and nearly all of the ...


Cygwin Installation
cygwin.com/install.html
Cygwin
Install Cygwin
Update Cygwin
Search Packages
Licensing Terms
Cygwin/X
Community
Reporting Problems
Mailing Lists
Newsgroups
IRC channels
Gold Stars
Mirror Sites
Donations
Documentation
FAQ
User's Guide
API Reference
Acronyms
Contributing
Snapshots
Source in Git
Cygwin Packages
Related Sites
英文
中文（繁體
Google Translate

Cygwin

Get that Linux feeling - on Windows

Installing and Updating Cygwin Packages

Installing and Updating Cygwin for 64-bit versions of Windows

Run setup-x86_64.exe any time you want to update or install a Cygwin package for 64-bit windows. The signature for setup-x86_64.exe can be used to verify the validity of this binary.

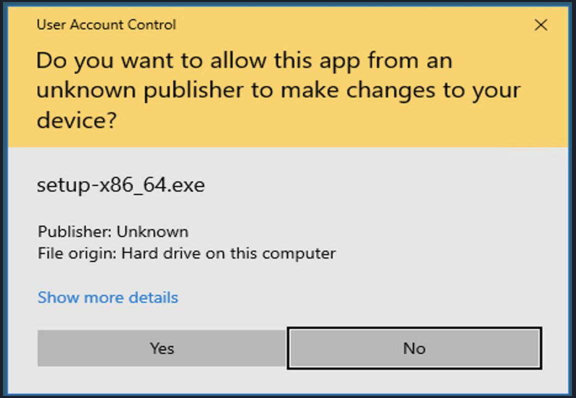
Installing and Updating Cygwin for 32-bit versions of Windows

Run setup-x86.exe any time you want to update or install a Cygwin package for 32-bit windows. The signature for setup-x86.exe can be used to verify the validity of this binary.

Signing key transition

The key used to sign setup binaries has been updated. During the transition period, signatures are made using both old (676041BA) and new (1A698DE9E2E56300) public keys here.

See this mail for more details.

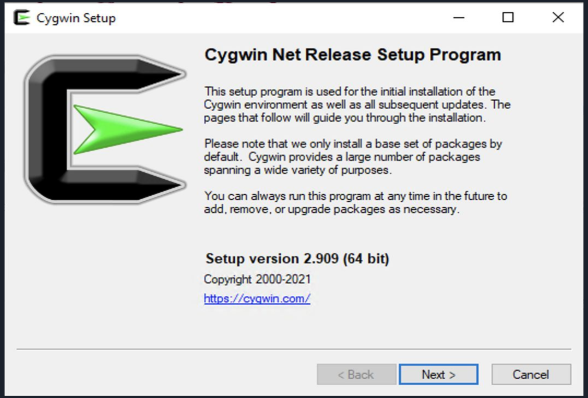


User Account Control

Do you want to allow this app from an unknown publisher to make changes to your device?

setup-x86_64.exe

Publisher: Unknown
File origin: Hard drive on this computer



Cygwin Setup

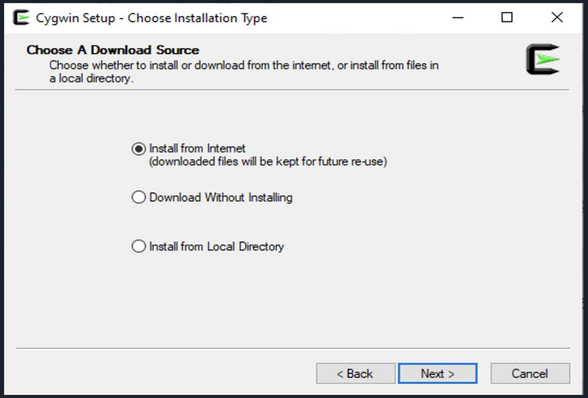
Cygwin Net Release Setup Program

This setup program is used for the initial installation of the Cygwin environment as well as all subsequent updates. The pages that follow will guide you through the installation.

Please note that we only install a base set of packages by default. Cygwin provides a large number of packages spanning a wide variety of purposes.

You can always run this program at any time in the future to add, remove, or upgrade packages as necessary.

Setup version 2.909 (64 bit)
Copyright 2000-2021
https://cygwin.com/



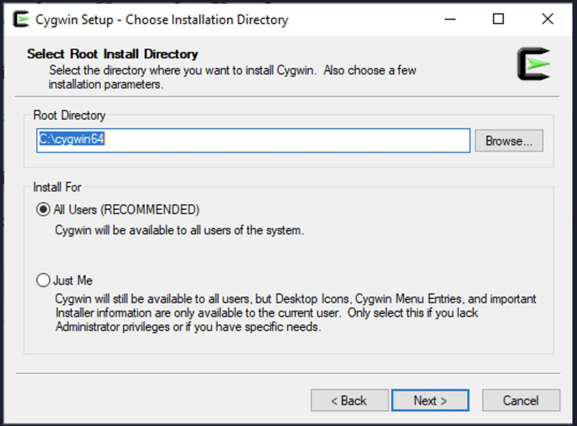
Cygwin Setup - Choose Installation Type

Choose A Download Source
Choose whether to install or download from the internet, or install from files in a local directory.

● Install from Internet
(downloaded files will be kept for future re-use)

○ Download Without Installing

○ Install from Local Directory



Cygwin Setup - Choose Installation Directory

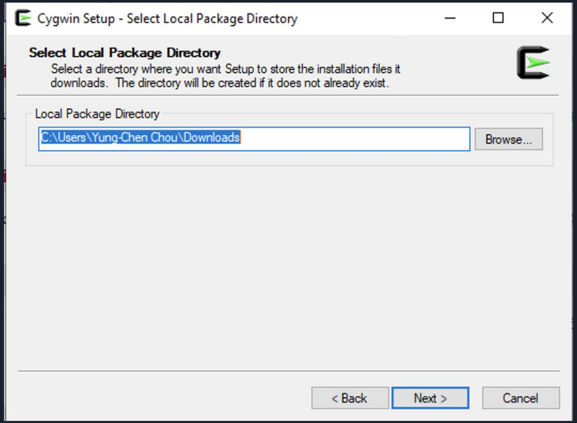
Select Root Install Directory
Select the directory where you want to install Cygwin. Also choose a few installation parameters.

Root Directory: C:\cygwin64

Install For

● All Users (RECOMMENDED)
Cygwin will be available to all users of the system.

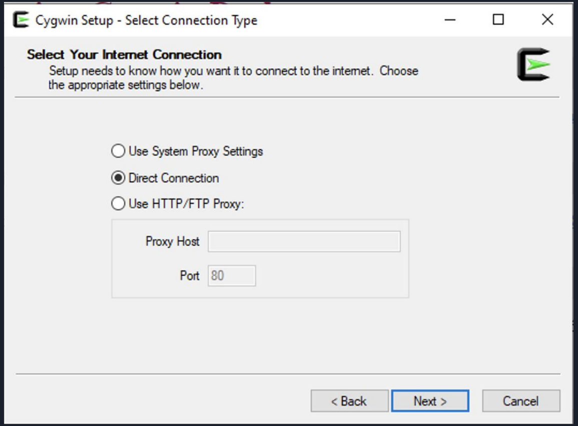
○ Just Me
Cygwin will still be available to all users, but Desktop Icons, Cygwin Menu Entries, and important Installer information are only available to the current user. Only select this if you lack Administrator privileges or if you have specific needs.



Cygwin Setup - Select Local Package Directory

Select Local Package Directory
Select a directory where you want Setup to store the installation files it downloads. The directory will be created if it does not already exist.

Local Package Directory: C:\Users\Yung-Chen Chou\Downloads

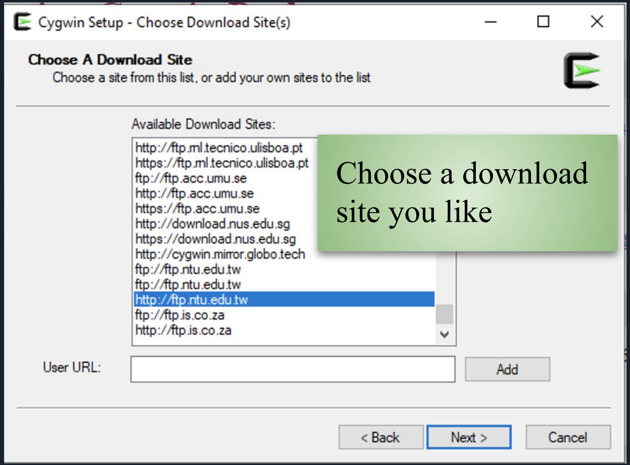


Cygwin Setup - Select Connection Type

Select Your Internet Connection
Setup needs to know how you want it to connect to the internet. Choose the appropriate settings below.

○ Use System Proxy Settings
● Direct Connection
○ Use HTTP/FTP Proxy:

Proxy Host:
Port: 80



Cygwin Setup - Choose Download Site(s)

Choose A Download Site

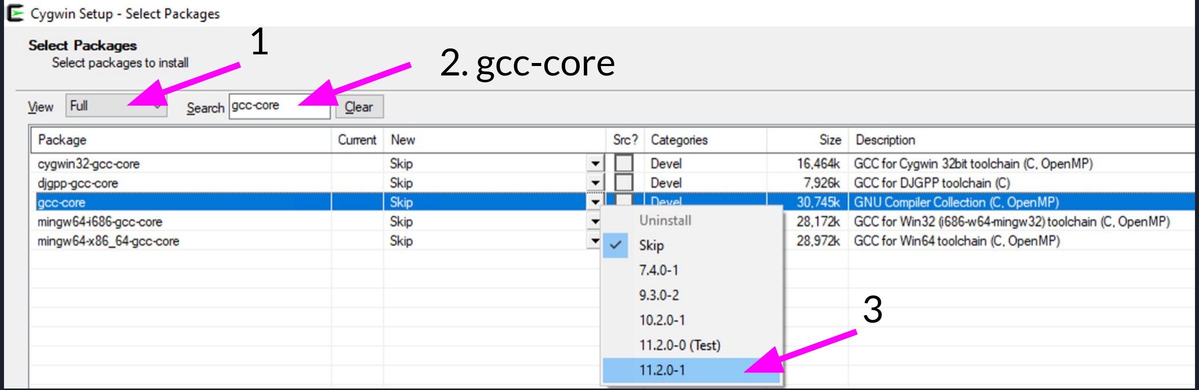
Choose a site from this list, or add your own sites to the list

Available Download Sites:

- http://ftp.ml.tecnico.ulisboa.pt
- https://ftp.ml.tecnico.ulisboa.pt
- ftp://ftp.acc.umu.se
- http://ftp.acc.umu.se
- https://ftp.acc.umu.se
- http://download.nus.edu.sg
- https://download.nus.edu.sg
- http://cygwin.mirror.globo.tech
- ftp://ftp.ntu.edu.tw
- ftp://ftp.ntu.edu.tw
- http://ftp.ntu.edu.tw
- ftp://ftp.is.co.za
- http://ftp.is.co.za

User URL:

Choose a download site you like



Cygwin Setup - Select Packages

Select Packages

Select packages to install

1

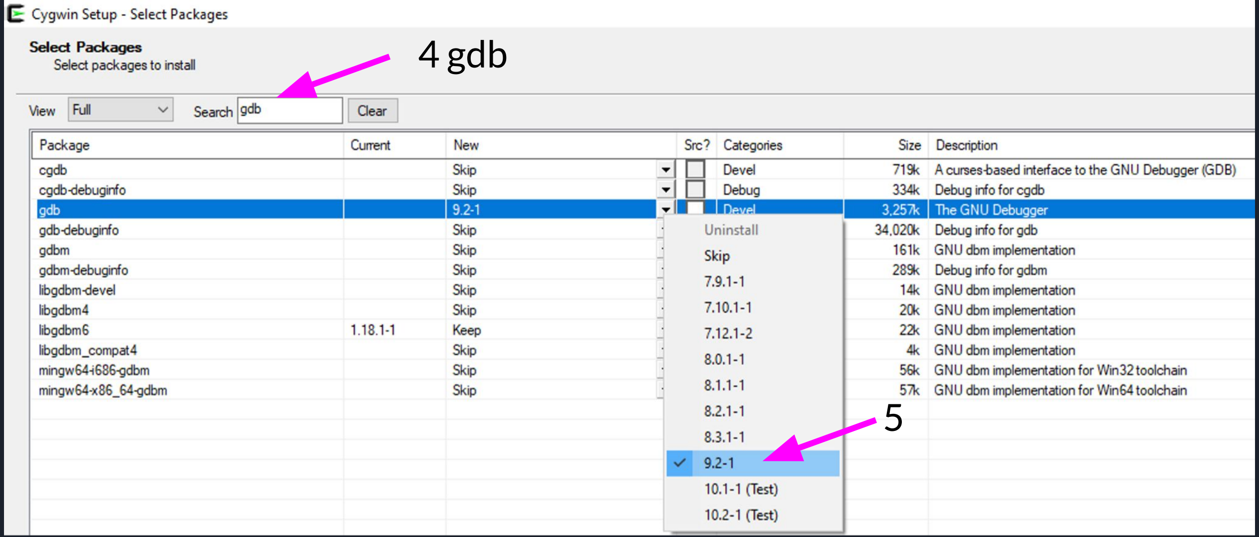
2. gcc-core

View: Full

Search: gcc-core

Package	Current	New	Src?	Categories	Size	Description
cygwin32-gcc-core		Skip	☐	Devel	16,464k	GCC for Cygwin 32bit toolchain (C, OpenMP)
djgpp-gcc-core		Skip	☐	Devel	7,926k	GCC for DJGPP toolchain (C)
gcc-core		Skip	☐	Devel	30,745k	GNU Compiler Collection (C, OpenMP)
mingw64-i686-gcc-core		Skip			28,172k	GCC for Win32 (i686-w64-mingw32) toolchain (C, OpenMP)
mingw64-x86_64-gcc-core		Skip			28,972k	GCC for Win64 toolchain (C, OpenMP)

3



Cygwin Setup - Select Packages

Select Packages

Select packages to install

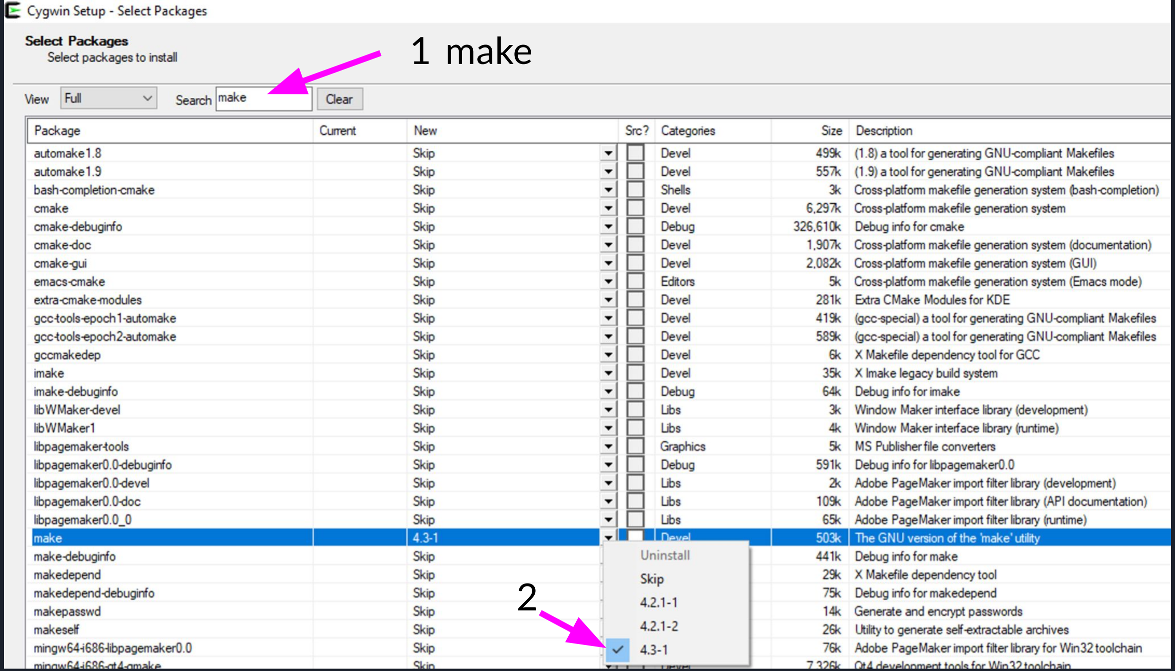
4 gdb

View: Full

Search: gdb

Package	Current	New	Src?	Categories	Size	Description
cgdb		Skip	☐	Devel	719k	A curses-based interface to the GNU Debugger (GDB)
cgdb-debuginfo		Skip	☐	Debug	334k	Debug info for cgdb
gdb		9.2-1	☐	Devel	3,257k	The GNU Debugger
gdb-debuginfo		Skip			34,020k	Debug info for gdb
gdbm		Skip			161k	GNU dbm implementation
gdbm-debuginfo		Skip			289k	Debug info for gdbm
libgdbm-devel		Skip			14k	GNU dbm implementation
libgdbm4		Skip			20k	GNU dbm implementation
libgdbm6	1.18.1-1	Keep			22k	GNU dbm implementation
libgdbm_compat4		Skip			4k	GNU dbm implementation
mingw64-i686-gdbm		Skip			56k	GNU dbm implementation for Win32 toolchain
mingw64-x86_64-gdbm		Skip			57k	GNU dbm implementation for Win64 toolchain

5



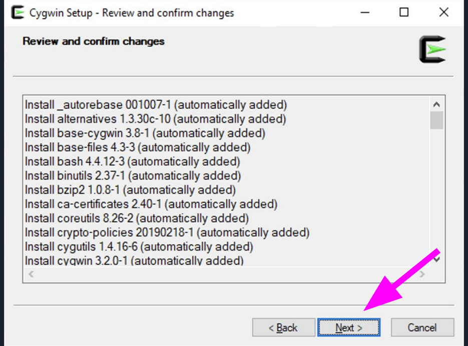
Select Packages
Select packages to install

1 make

View: Full — Search: make — Clear

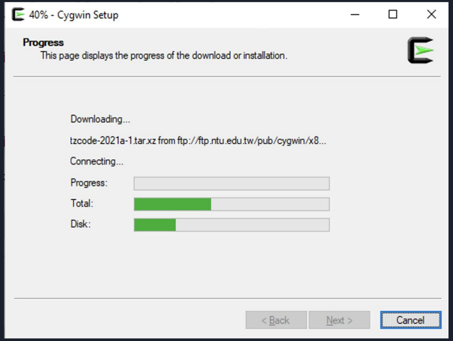
Package	Current	New	Src?	Categories	Size	Description
automake1.8		Skip	☐	Devel	499k	(1.8) a tool for generating GNU-compliant Makefiles
automake1.9		Skip	☐	Devel	557k	(1.9) a tool for generating GNU-compliant Makefiles
bash-completion-cmake		Skip	☐	Shells	3k	Cross-platform makefile generation system (bash-completion)
cmake		Skip	☐	Devel	6,297k	Cross-platform makefile generation system
cmake-debuginfo		Skip	☐	Debug	326,610k	Debug info for cmake
cmake-doc		Skip	☐	Devel	1,907k	Cross-platform makefile generation system (documentation)
cmake-gui		Skip	☐	Devel	2,082k	Cross-platform makefile generation system (GUI)
emacs-cmake		Skip	☐	Editors	5k	Cross-platform makefile generation system (Emacs mode)
extra-cmake-modules		Skip	☐	Devel	281k	Extra CMake Modules for KDE
gcc-tools-epoch1-automake		Skip	☐	Devel	419k	(gcc-special) a tool for generating GNU-compliant Makefiles
gcc-tools-epoch2-automake		Skip	☐	Devel	589k	(gcc-special) a tool for generating GNU-compliant Makefiles
gccmakedep		Skip	☐	Devel	6k	X Makefile dependency tool for GCC
imake		Skip	☐	Devel	35k	X Imake legacy build system
imake-debuginfo		Skip	☐	Debug	64k	Debug info for imake
libWMaker-devel		Skip	☐	Libs	3k	Window Maker interface library (development)
libWMaker1		Skip	☐	Libs	4k	Window Maker interface library (runtime)
libpagemaker-tools		Skip	☐	Graphics	5k	MS Publisher file converters
libpagemaker0.0-debuginfo		Skip	☐	Debug	591k	Debug info for libpagemaker0.0
libpagemaker0.0-devel		Skip	☐	Libs	2k	Adobe PageMaker import filter library (development)
libpagemaker0.0-doc		Skip	☐	Libs	109k	Adobe PageMaker import filter library (API documentation)
libpagemaker0.0_0		Skip	☐	Libs	65k	Adobe PageMaker import filter library (runtime)
make		4.3-1	☐	Devel	503k	The GNU version of the 'make' utility
make-debuginfo		Skip			441k	Debug info for make
makedepend		Skip			29k	X Makefile dependency tool
makedepend-debuginfo		Skip			75k	Debug info for makedepend
makepasswd		Skip			14k	Generate and encrypt passwords
makeself		Skip			26k	Utility to generate self-extractable archives
mingw64-i686-libpagemaker0.0		Skip			76k	Adobe PageMaker import filter library for Win32 toolchain
mingw64-i686-qt4-qmake		Skip		Devel	7,326k	Qt4 development tools for Win32 toolchain

2



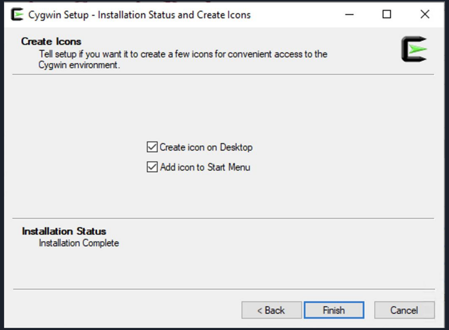
Review and confirm changes

Install _autorebase 001007-1 (automatically added)
Install alternatives 1.3.30c-10 (automatically added)
Install base-cygwin 3.8-1 (automatically added)
Install base-files 4.3-3 (automatically added)
Install bash 4.4.12-3 (automatically added)
Install binutils 2.37-1 (automatically added)
Install bzip2 1.0.8-1 (automatically added)
Install ca-certificates 2.40-1 (automatically added)
Install coreutils 8.26-2 (automatically added)
Install crypto-policies 20190218-1 (automatically added)
Install cygutils 1.4.16-6 (automatically added)
Install cygwin 3.2.0-1 (automatically added)



Progress
This page displays the progress of the download or installation.

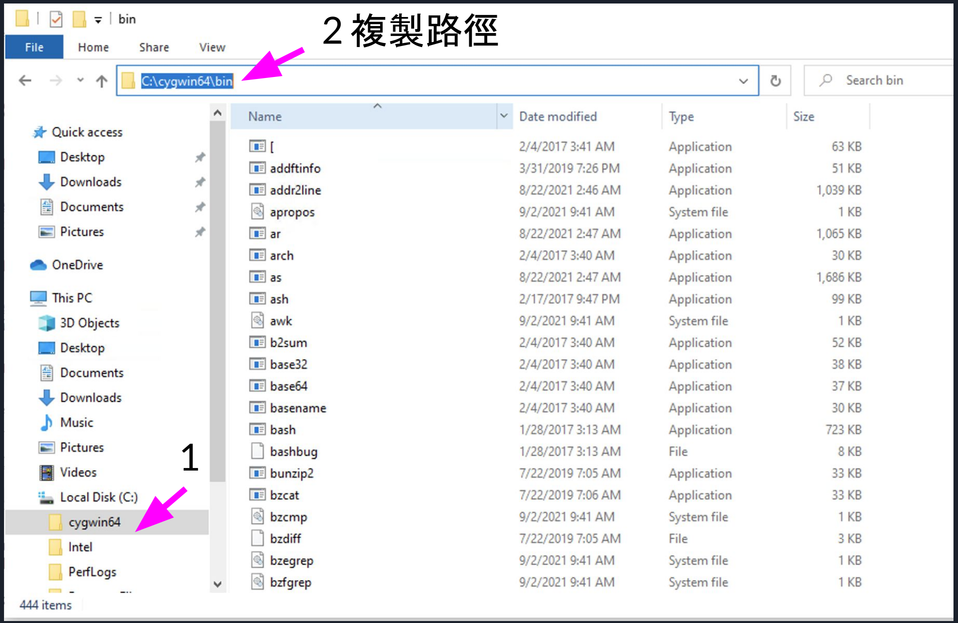
Downloading...
tzcode-2021a-1.tar.xz from ftp://ftp.ntu.edu.tw/pub/cygwin/x8...
Connecting...



Create Icons
Tell setup if you want it to create a few icons for convenient access to the Cygwin environment.

☑ Create icon on Desktop
☑ Add icon to Start Menu

Installation Status
Installation Complete

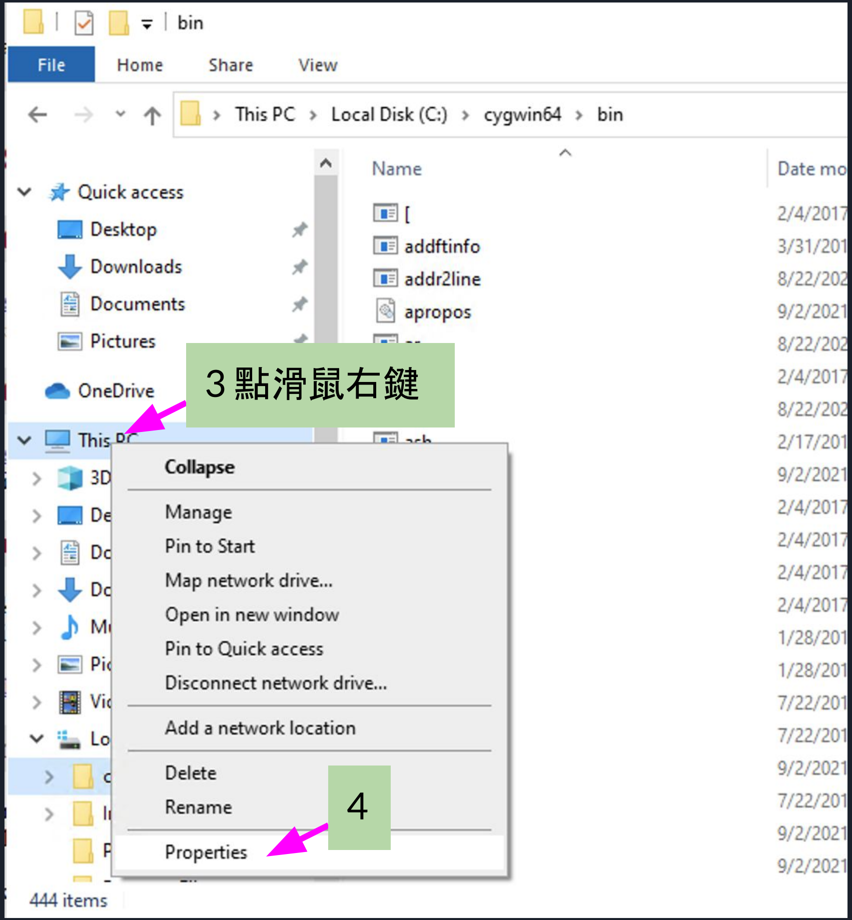

bin
File
Home
Share
View
Search bin
Quick access
Desktop
Downloads
Documents
Pictures
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
cygwin64
Intel
PerfLogs
444 items

1

2 複製路徑

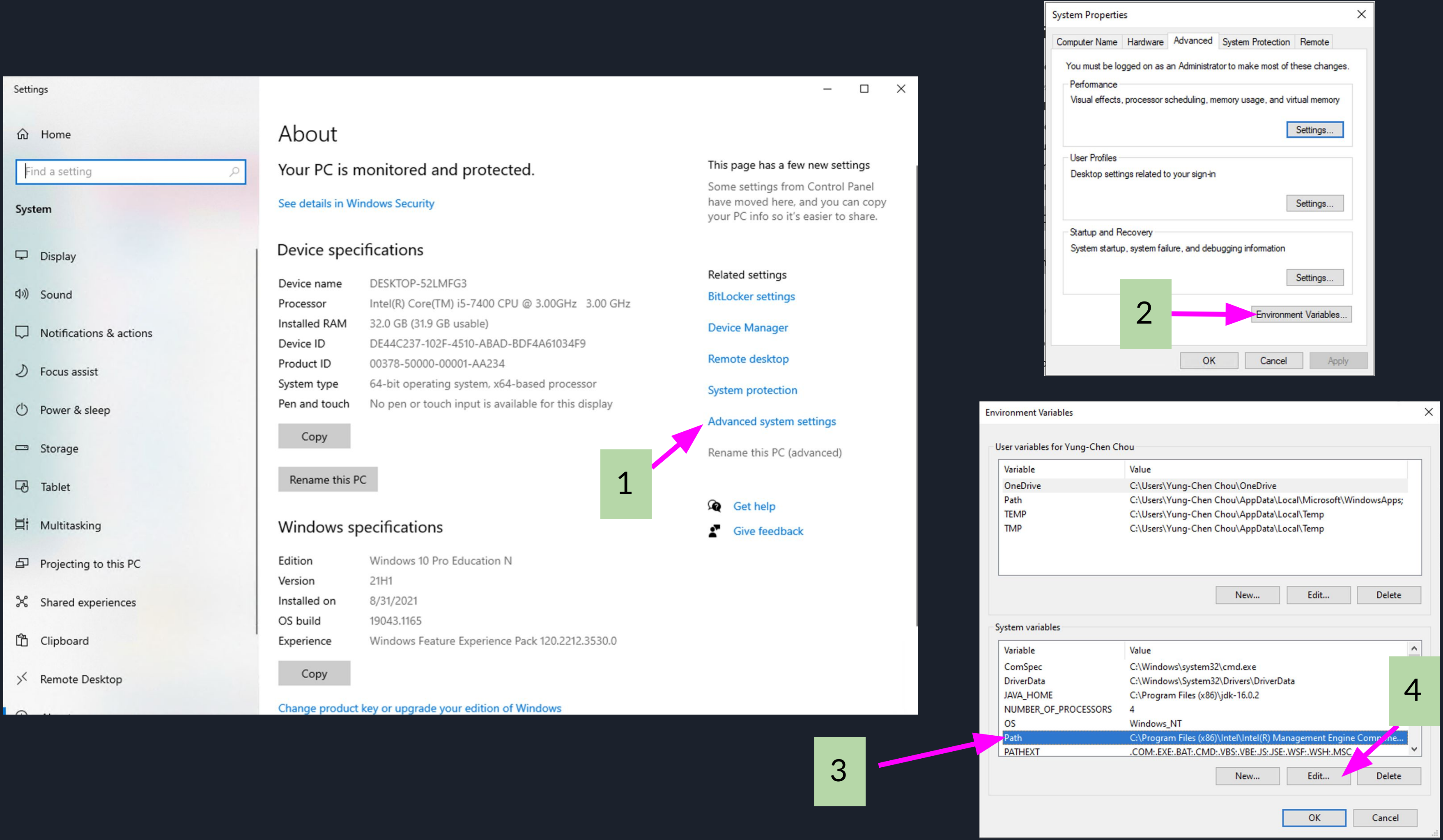
C:\cygwin64\bin

Name	Date modified	Type	Size
[	2/4/2017 3:41 AM	Application	63 KB
addftinfo	3/31/2019 7:26 PM	Application	51 KB
addr2line	8/22/2021 2:46 AM	Application	1,039 KB
apropos	9/2/2021 9:41 AM	System file	1 KB
ar	8/22/2021 2:47 AM	Application	1,065 KB
arch	2/4/2017 3:40 AM	Application	30 KB
as	8/22/2021 2:47 AM	Application	1,686 KB
ash	2/17/2017 9:47 PM	Application	99 KB
awk	9/2/2021 9:41 AM	System file	1 KB
b2sum	2/4/2017 3:40 AM	Application	52 KB
base32	2/4/2017 3:40 AM	Application	38 KB
base64	2/4/2017 3:40 AM	Application	37 KB
basename	2/4/2017 3:40 AM	Application	30 KB
bash	1/28/2017 3:13 AM	Application	723 KB
bashbug	1/28/2017 3:13 AM	File	8 KB
bunzip2	7/22/2019 7:05 AM	Application	33 KB
bzcat	7/22/2019 7:06 AM	Application	33 KB
bzcmp	9/2/2021 9:41 AM	System file	1 KB
bzdiff	7/22/2019 7:05 AM	File	3 KB
bzegrep	9/2/2021 9:41 AM	System file	1 KB
bzfgrep	9/2/2021 9:41 AM	System file	1 KB


bin
File
Home
Share
View
This PC › Local Disk (C:) › cygwin64 › bin
Quick access
Desktop
Downloads
Documents
Pictures
OneDrive
This PC
Name
Date mo
[
addftinfo
addr2line
apropos
Collapse
Manage
Pin to Start
Map network drive...
Open in new window
Pin to Quick access
Disconnect network drive...
Add a network location
Delete
Rename
Properties
444 items

3 點滑鼠右鍵

4


Settings
Home
Find a setting
System
Display
Sound
Notifications & actions
Focus assist
Power & sleep
Storage
Tablet
Multitasking
Projecting to this PC
Shared experiences
Clipboard
Remote Desktop

About

Your PC is monitored and protected.

See details in Windows Security

Device specifications

Device name	DESKTOP-52LMFG3
Processor	Intel(R) Core(TM) i5-7400 CPU @ 3.00GHz 3.00 GHz
Installed RAM	32.0 GB (31.9 GB usable)
Device ID	DE44C237-102F-4510-ABAD-BDF4A61034F9
Product ID	00378-50000-00001-AA234
System type	64-bit operating system, x64-based processor
Pen and touch	No pen or touch input is available for this display

Copy
Rename this PC

Windows specifications

Edition	Windows 10 Pro Education N
Version	21H1
Installed on	8/31/2021
OS build	19043.1165
Experience	Windows Feature Experience Pack 120.2212.3530.0

Copy
Change product key or upgrade your edition of Windows

This page has a few new settings

Some settings from Control Panel have moved here, and you can copy your PC info so it's easier to share.

Related settings
BitLocker settings
Device Manager
Remote desktop
System protection
1
Advanced system settings
Rename this PC (advanced)
Get help
Give feedback

System Properties

Computer Name
Hardware
Advanced
System Protection
Remote

You must be logged on as an Administrator to make most of these changes.

Performance

Visual effects, processor scheduling, memory usage, and virtual memory

User Profiles

Desktop settings related to your sign-in

Startup and Recovery

System startup, system failure, and debugging information

Settings...
2
Environment Variables...
OK
Cancel
Apply

Environment Variables

User variables for Yung-Chen Chou

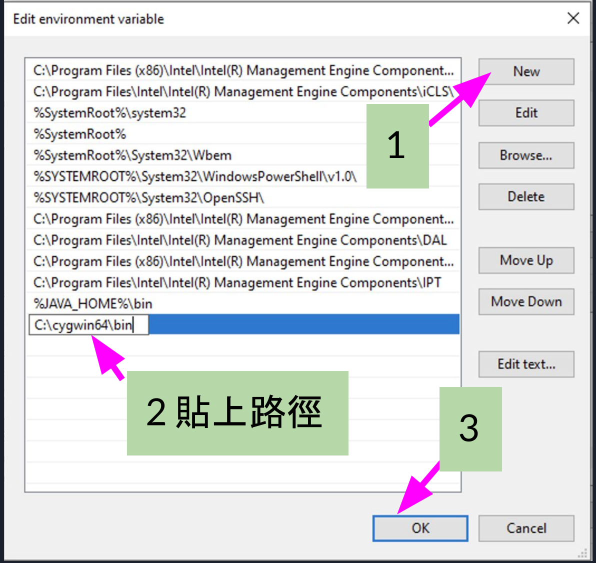
Variable	Value
OneDrive	C:\Users\Yung-Chen Chou\OneDrive
Path	C:\Users\Yung-Chen Chou\AppData\Local\Microsoft\WindowsApps;
TEMP	C:\Users\Yung-Chen Chou\AppData\Local\Temp
TMP	C:\Users\Yung-Chen Chou\AppData\Local\Temp

New...
Edit...
Delete

System variables

Variable	Value
ComSpec	C:\Windows\system32\cmd.exe
DriverData	C:\Windows\System32\Drivers\DriverData
JAVA_HOME	C:\Program Files (x86)\jdk-16.0.2
NUMBER_OF_PROCESSORS	4
OS	Windows_NT
Path	C:\Program Files (x86)\Intel\Intel(R) Management Engine Comp ne...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC

3
4
New...
Edit...
Delete
OK
Cancel

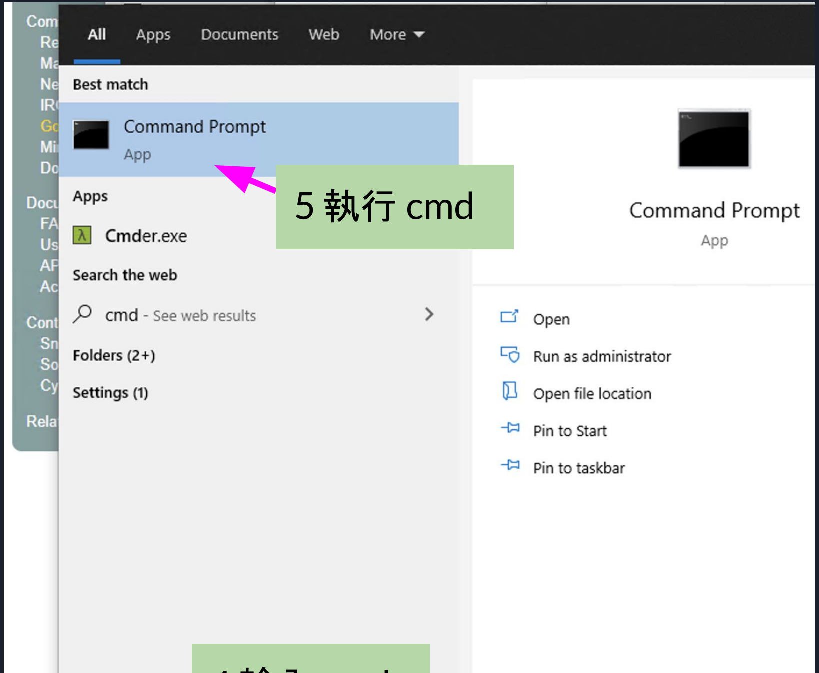

Edit environment variable
New
Edit
Browse...
Delete
Move Up
Move Down
Edit text...
OK
Cancel

C:\Program Files (x86)\Intel\Intel(R) Management Engine Component...
C:\Program Files\Intel\Intel(R) Management Engine Components\iCLS\
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
%SYSTEMROOT%\System32\WindowsPowerShell\v1.0\
%SYSTEMROOT%\System32\OpenSSH\
C:\Program Files (x86)\Intel\Intel(R) Management Engine Component...
C:\Program Files\Intel\Intel(R) Management Engine Components\DAL
C:\Program Files (x86)\Intel\Intel(R) Management Engine Component...
C:\Program Files\Intel\Intel(R) Management Engine Components\IPT
%JAVA_HOME%\bin
C:\cygwin64\bin

1

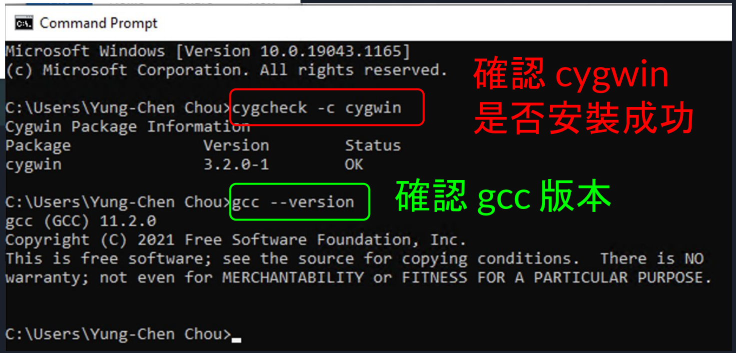
2 貼上路徑

3


All
Apps
Documents
Web
More
Best match
Command Prompt
App
Apps
Cmder.exe
Search the web
cmd - See web results
Folders (2+)
Settings (1)
Command Prompt
App
Open
Run as administrator
Open file location
Pin to Start
Pin to taskbar
cmd

5 執行 cmd

4 輸入 cmd


Command Prompt

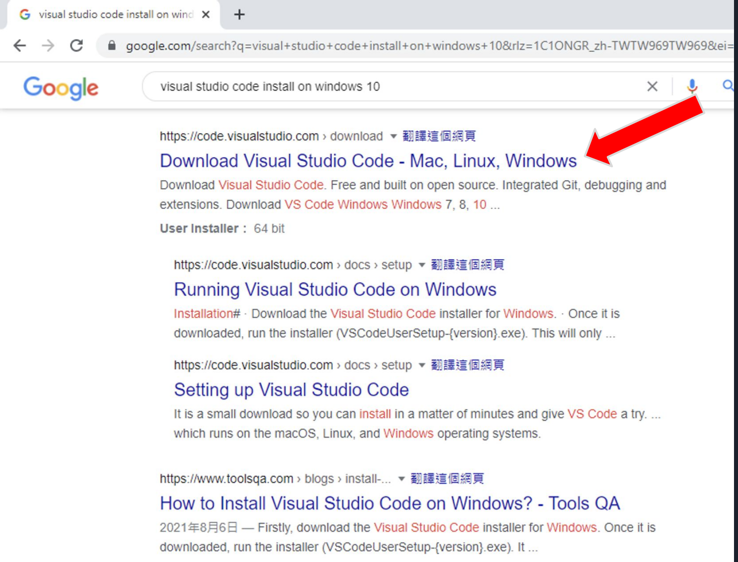
```
Microsoft Windows [Version 10.0.19043.1165]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Yung-Chen Chou>cygcheck -c cygwin
Cygwin Package Information
Package              Version        Status
cygwin               3.2.0-1        OK

C:\Users\Yung-Chen Chou>gcc --version
gcc (GCC) 11.2.0
Copyright (C) 2021 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

C:\Users\Yung-Chen Chou>_
```

確認 cygwin
是否安裝成功

確認 gcc 版本

Coding Environment

Install VS Code on Windows 10


visual studio code install on wind
google.com/search?q=visual+studio+code+install+on+windows+10&rlz=1C1ONGR_zh-TWTW969TW969&ei=
Google
visual studio code install on windows 10

https://code.visualstudio.com › download ▾ 翻譯這個網頁

Download Visual Studio Code - Mac, Linux, Windows

Download Visual Studio Code. Free and built on open source. Integrated Git, debugging and extensions. Download VS Code Windows Windows 7, 8, 10 ...

User Installer : 64 bit

https://code.visualstudio.com › docs › setup ▾ 翻譯這個網頁

Running Visual Studio Code on Windows

Installation# · Download the Visual Studio Code installer for Windows. · Once it is downloaded, run the installer (VSCodeUserSetup-{version}.exe). This will only ...

https://code.visualstudio.com › docs › setup ▾ 翻譯這個網頁

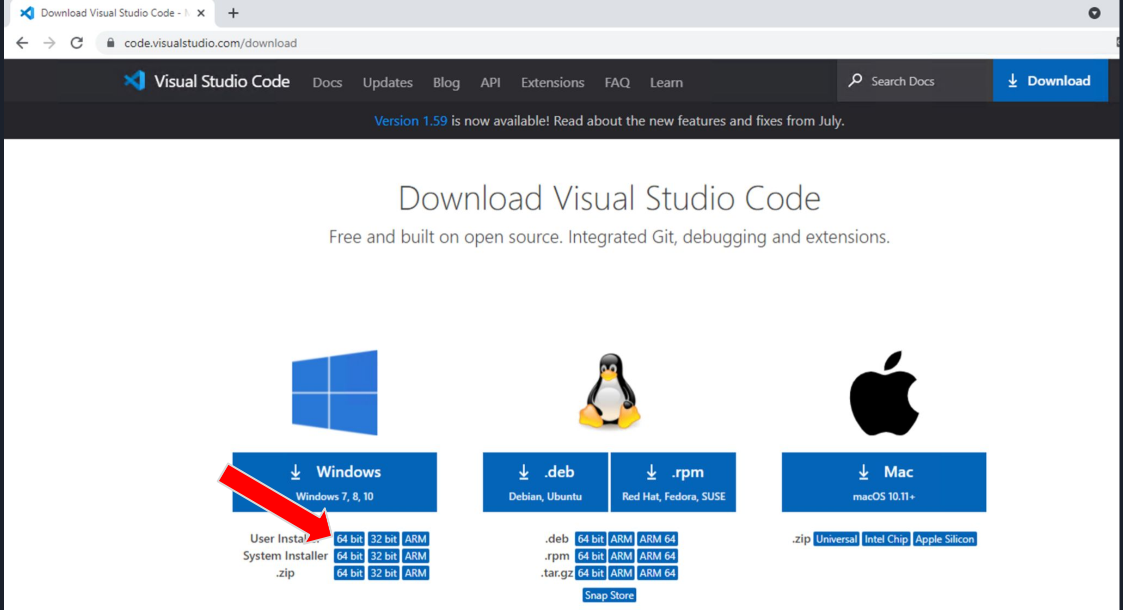
Setting up Visual Studio Code

It is a small download so you can install in a matter of minutes and give VS Code a try. ... which runs on the macOS, Linux, and Windows operating systems.

https://www.toolsqa.com › blogs › install-... ▾ 翻譯這個網頁

How to Install Visual Studio Code on Windows? - Tools QA

2021年8月6日 — Firstly, download the Visual Studio Code installer for Windows. Once it is downloaded, run the installer (VSCodeUserSetup-{version}.exe). It ...

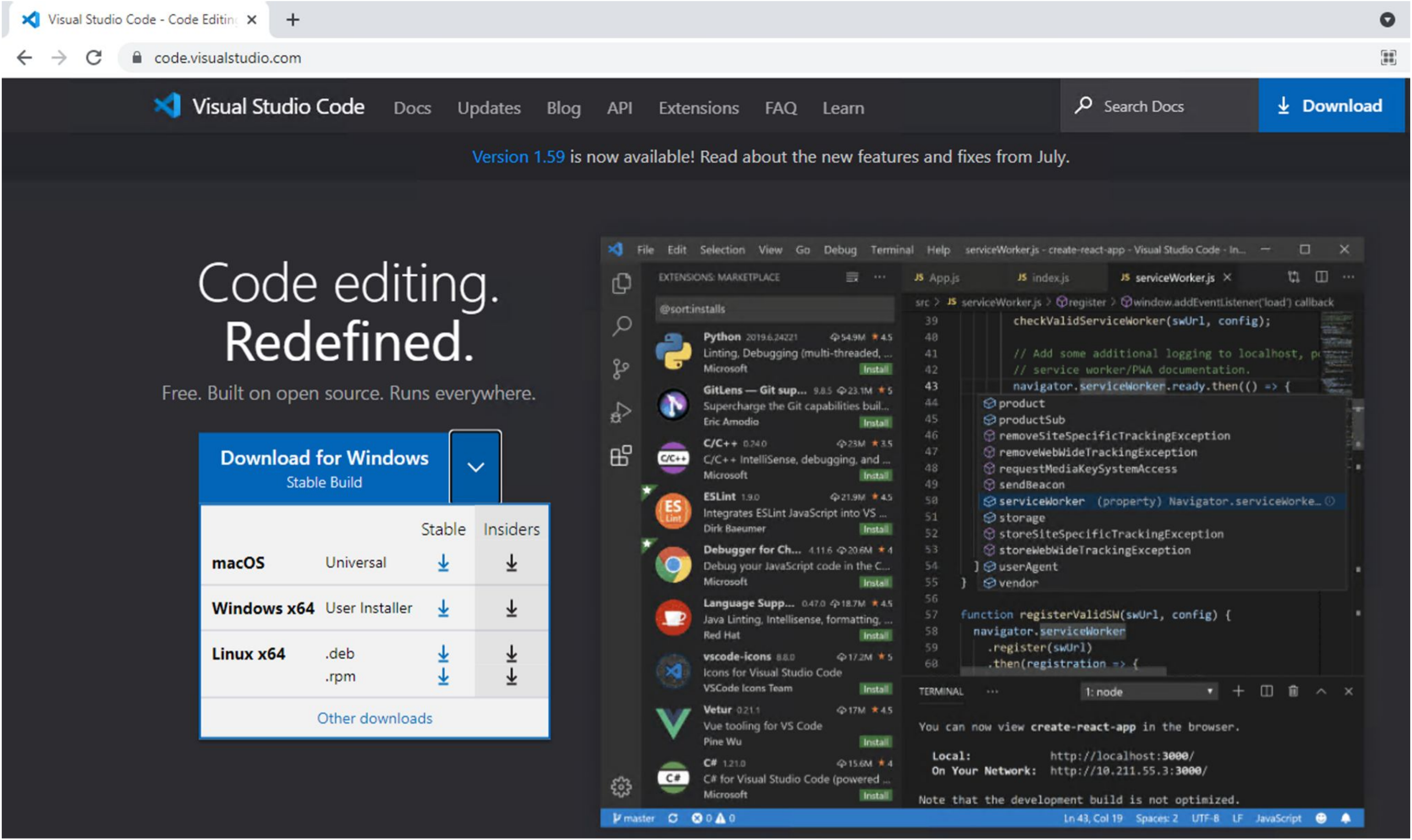

Download Visual Studio Code - M
code.visualstudio.com/download
Visual Studio Code
Docs
Updates
Blog
API
Extensions
FAQ
Learn
Search Docs
Download
Windows
Windows 7, 8, 10
.deb
Debian, Ubuntu
.rpm
Red Hat, Fedora, SUSE
Mac
macOS 10.11+
User Installer 64 bit 32 bit ARM
System Installer 64 bit 32 bit ARM
.zip 64 bit 32 bit ARM
.deb 64 bit ARM ARM 64
.rpm 64 bit ARM ARM 64
.tar.gz 64 bit ARM ARM 64
Snap Store
.zip Universal Intel Chip Apple Silicon

Version 1.59 is now available! Read about the new features and fixes from July.

Download Visual Studio Code

Free and built on open source. Integrated Git, debugging and extensions.

另一個方式，直接連到https://code.visualstudio.com 下載 Windows 版 VS Code 進行 安裝


Visual Studio Code - Code Editin
code.visualstudio.com
Visual Studio Code
Docs
Updates
Blog
API
Extensions
FAQ
Learn
Search Docs
Download
Download for Windows
Stable Build
Other downloads
File Edit Selection View Go Debug Terminal Help
serviceWorker.js - create-react-app - Visual Studio Code - In...
EXTENSIONS: MARKETPLACE
@sort:installs
Python
GitLens — Git sup...
C/C++
ESLint
Debugger for Ch...
Language Supp...
vscode-icons
Vetur
C#
App.js
index.js
serviceWorker.js
TERMINAL
1: node
master
Ln 43, Col 19
Spaces: 2
UTF-8
LF
JavaScript

Version 1.59 is now available! Read about the new features and fixes from July.

Code editing.
Redefined.

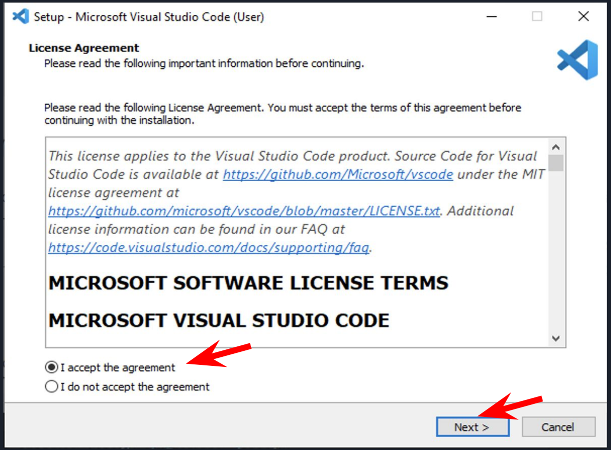
Free. Built on open source. Runs everywhere.

		Stable	Insiders
macOS	Universal	↓	↓
Windows x64	User Installer	↓	↓
Linux x64	.deb .rpm	↓ ↓	↓ ↓

```
    checkValidServiceWorker(swUrl, config);

    // Add some additional logging to localhost, p
    // service worker/PWA documentation.
    navigator.serviceWorker.ready.then(() => {
```

```
function registerValidSW(swUrl, config) {
  navigator.serviceWorker
    .register(swUrl)
    .then(registration => {
```

```
You can now view create-react-app in the browser.

  Local:            http://localhost:3000/
  On Your Network:  http://10.211.55.3:3000/

Note that the development build is not optimized.
```


Setup - Microsoft Visual Studio Code (User)
Next >
Cancel

License Agreement
Please read the following important information before continuing.

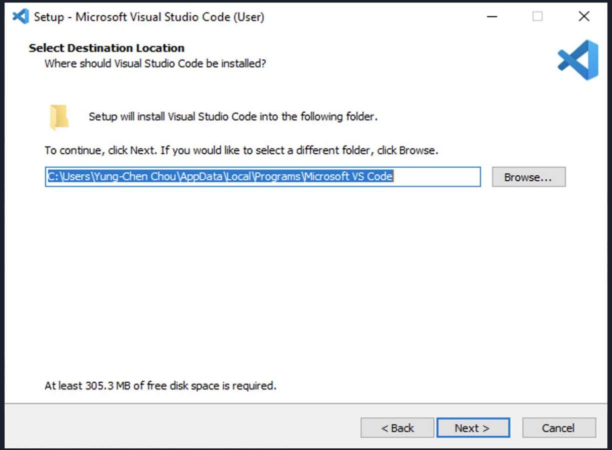
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

This license applies to the Visual Studio Code product. Source Code for Visual Studio Code is available at https://github.com/Microsoft/vscode under the MIT license agreement at https://github.com/microsoft/vscode/blob/master/LICENSE.txt. Additional license information can be found in our FAQ at https://code.visualstudio.com/docs/supporting/faq.

MICROSOFT SOFTWARE LICENSE TERMS

MICROSOFT VISUAL STUDIO CODE

● I accept the agreement
○ I do not accept the agreement


Setup - Microsoft Visual Studio Code (User)
Browse...
< Back
Next >
Cancel

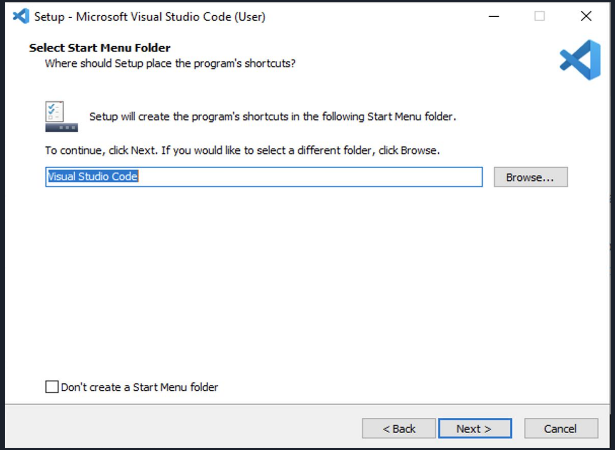
Select Destination Location
Where should Visual Studio Code be installed?

Setup will install Visual Studio Code into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\Users\Yung-Chen Chou\AppData\Local\Programs\Microsoft VS Code

At least 305.3 MB of free disk space is required.


Setup - Microsoft Visual Studio Code (User)
Browse...
< Back
Next >
Cancel

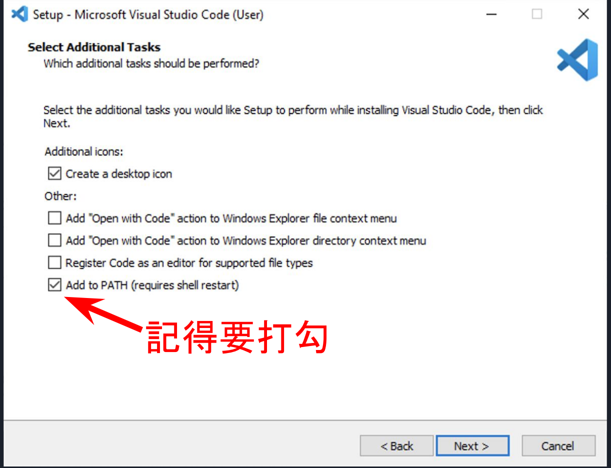
Select Start Menu Folder
Where should Setup place the program's shortcuts?

Setup will create the program's shortcuts in the following Start Menu folder.

To continue, click Next. If you would like to select a different folder, click Browse.

Visual Studio Code

☐ Don't create a Start Menu folder

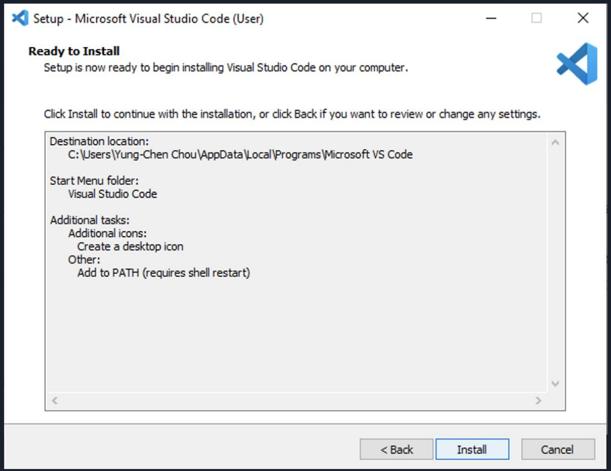

Setup - Microsoft Visual Studio Code (User)
< Back
Next >
Cancel

Select Additional Tasks
Which additional tasks should be performed?

Select the additional tasks you would like Setup to perform while installing Visual Studio Code, then click Next.

Additional icons:
☑ Create a desktop icon
Other:
☐ Add "Open with Code" action to Windows Explorer file context menu
☐ Add "Open with Code" action to Windows Explorer directory context menu
☐ Register Code as an editor for supported file types
☑ Add to PATH (requires shell restart)

記得要打勾


Setup - Microsoft Visual Studio Code (User)
< Back
Install
Cancel

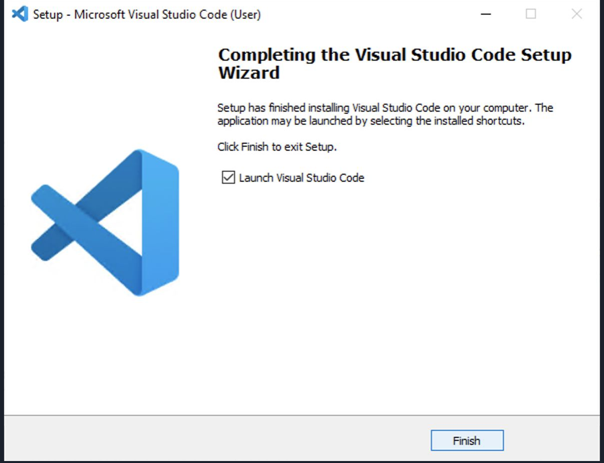
Ready to Install
Setup is now ready to begin installing Visual Studio Code on your computer.

Click Install to continue with the installation, or click Back if you want to review or change any settings.

Destination location:
C:\Users\Yung-Chen Chou\AppData\Local\Programs\Microsoft VS Code

Start Menu folder:
Visual Studio Code

Additional tasks:
Additional icons:
Create a desktop icon
Other:
Add to PATH (requires shell restart)

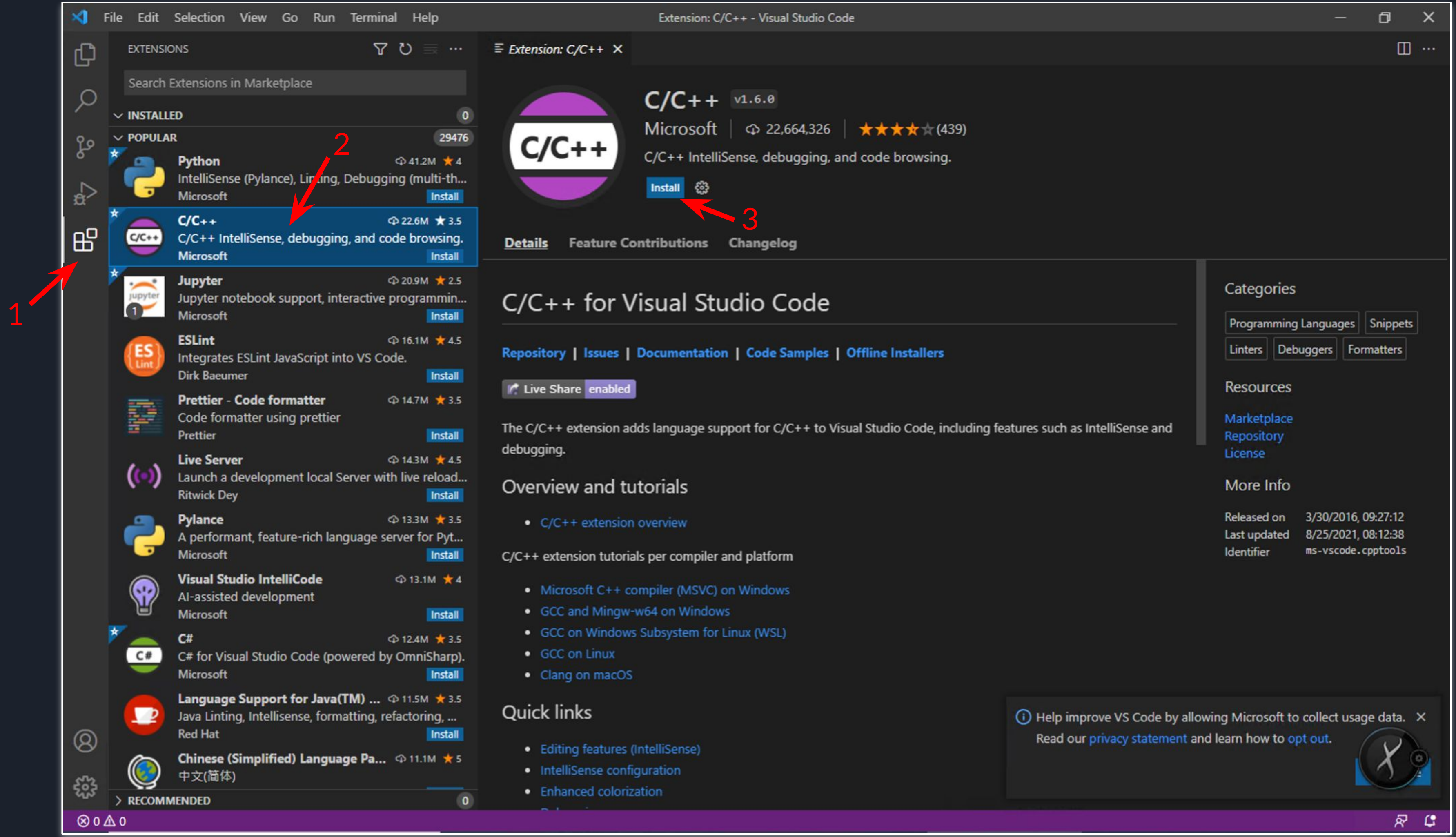

Setup - Microsoft Visual Studio Code (User)
Finish

Completing the Visual Studio Code Setup Wizard

Setup has finished installing Visual Studio Code on your computer. The application may be launched by selecting the installed shortcuts.

Click Finish to exit Setup.

☑ Launch Visual Studio Code


File Edit Selection View Go Run Terminal Help
Extension: C/C++ - Visual Studio Code
EXTENSIONS
Search Extensions in Marketplace
INSTALLED 0
POPULAR 29476
RECOMMENDED 0
1
2
3
Extension: C/C++
Install
Details
Feature Contributions
Changelog
⊗ 0 ⚠ 0

Python 41.2M ★ 4
IntelliSense (Pylance), Linting, Debugging (multi-th...
Microsoft Install

C/C++ 22.6M ★ 3.5
C/C++ IntelliSense, debugging, and code browsing.
Microsoft Install

Jupyter 20.9M ★ 2.5
Jupyter notebook support, interactive programmin...
Microsoft Install

ESLint 16.1M ★ 4.5
Integrates ESLint JavaScript into VS Code.
Dirk Baeumer Install

Prettier - Code formatter 14.7M ★ 3.5
Code formatter using prettier
Prettier Install

Live Server 14.3M ★ 4.5
Launch a development local Server with live reload...
Ritwick Dey Install

Pylance 13.3M ★ 3.5
A performant, feature-rich language server for Pyt...
Microsoft Install

Visual Studio IntelliCode 13.1M ★ 4
AI-assisted development
Microsoft Install

C# 12.4M ★ 3.5
C# for Visual Studio Code (powered by OmniSharp).
Microsoft Install

Language Support for Java(TM) ... 11.5M ★ 3.5
Java Linting, Intellisense, formatting, refactoring, ...
Red Hat Install

Chinese (Simplified) Language Pa... 11.1M ★ 5
中文(简体)

C/C++ v1.6.0
Microsoft | 22,664,326 | ★★★★☆ (439)
C/C++ IntelliSense, debugging, and code browsing.

C/C++ for Visual Studio Code

Repository | Issues | Documentation | Code Samples | Offline Installers

Live Share enabled

The C/C++ extension adds language support for C/C++ to Visual Studio Code, including features such as IntelliSense and debugging.

Overview and tutorials

- C/C++ extension overview

C/C++ extension tutorials per compiler and platform

- Microsoft C++ compiler (MSVC) on Windows
- GCC and Mingw-w64 on Windows
- GCC on Windows Subsystem for Linux (WSL)
- GCC on Linux
- Clang on macOS

Quick links

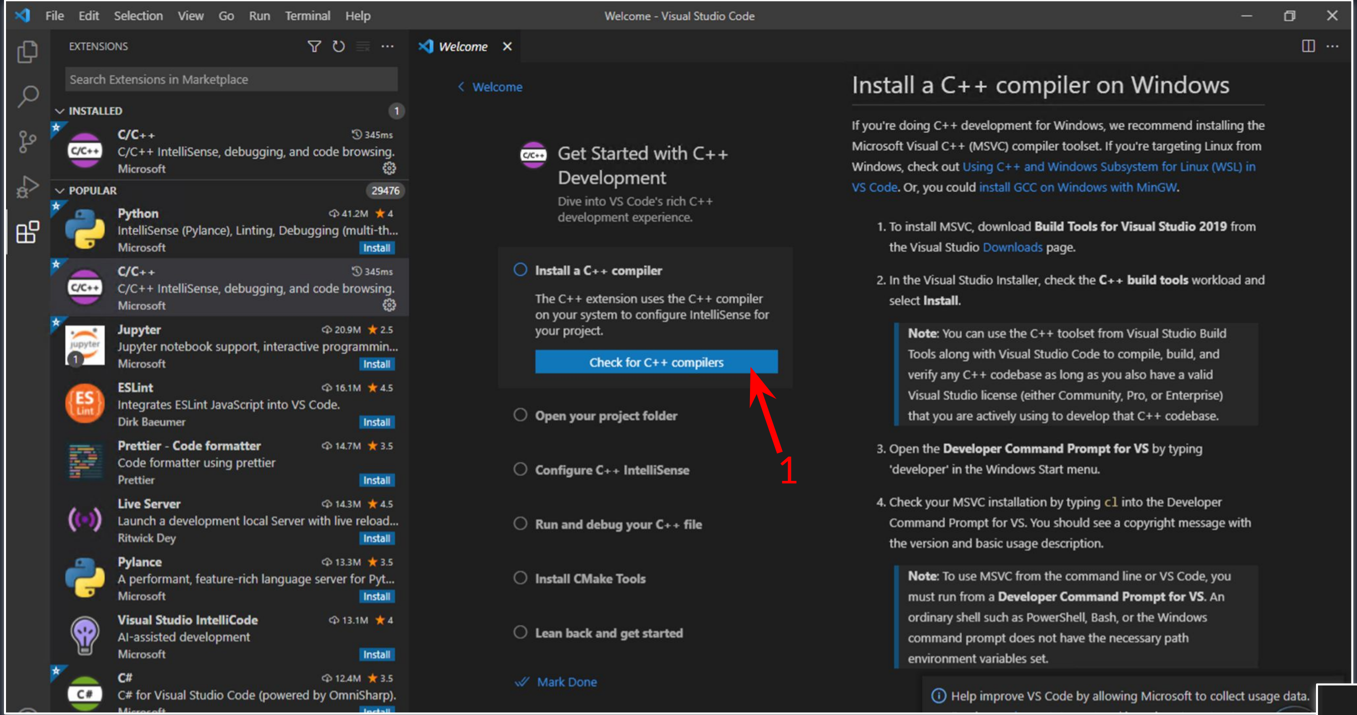
- Editing features (IntelliSense)
- IntelliSense configuration
- Enhanced colorization

Categories
Programming Languages | Snippets | Linters | Debuggers | Formatters

Resources
Marketplace
Repository
License

More Info
Released on 3/30/2016, 09:27:12
Last updated 8/25/2021, 08:12:38
Identifier ms-vscode.cpptools

Help improve VS Code by allowing Microsoft to collect usage data. Read our privacy statement and learn how to opt out.


File
Edit
Selection
View
Go
Run
Terminal
Help
Welcome - Visual Studio Code
EXTENSIONS
Search Extensions in Marketplace
INSTALLED
1
C/C++
345ms
C/C++ IntelliSense, debugging, and code browsing.
Microsoft
POPULAR
29476
Python
41.2M
4
IntelliSense (Pylance), Linting, Debugging (multi-th...
Microsoft
Install
C/C++
345ms
C/C++ IntelliSense, debugging, and code browsing.
Microsoft
Jupyter
20.9M
2.5
Jupyter notebook support, interactive programmin...
Microsoft
Install
ESLint
16.1M
4.5
Integrates ESLint JavaScript into VS Code.
Dirk Baeumer
Install
Prettier - Code formatter
14.7M
3.5
Code formatter using prettier
Prettier
Install
Live Server
14.3M
4.5
Launch a development local Server with live reload...
Ritwick Dey
Install
Pylance
13.3M
3.5
A performant, feature-rich language server for Pyt...
Microsoft
Install
Visual Studio IntelliCode
13.1M
4
AI-assisted development
Microsoft
Install
C#
12.4M
3.5
C# for Visual Studio Code (powered by OmniSharp).
Welcome
Welcome
Get Started with C++ Development
Dive into VS Code's rich C++ development experience.
○ Install a C++ compiler
Check for C++ compilers
1
○ Open your project folder
○ Configure C++ IntelliSense
○ Run and debug your C++ file
○ Install CMake Tools
○ Lean back and get started
Mark Done

The C++ extension uses the C++ compiler on your system to configure IntelliSense for your project.

Install a C++ compiler on Windows

If you're doing C++ development for Windows, we recommend installing the Microsoft Visual C++ (MSVC) compiler toolset. If you're targeting Linux from Windows, check out Using C++ and Windows Subsystem for Linux (WSL) in VS Code. Or, you could install GCC on Windows with MinGW.

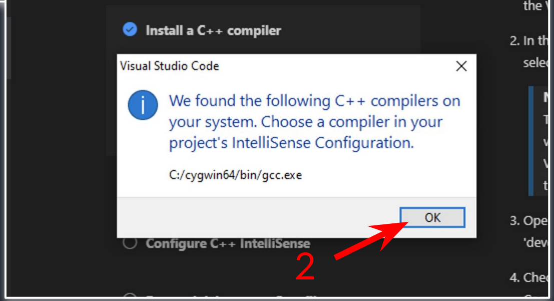
1. To install MSVC, download **Build Tools for Visual Studio 2019** from the Visual Studio Downloads page.
2. In the Visual Studio Installer, check the **C++ build tools** workload and select **Install**.

   > **Note**: You can use the C++ toolset from Visual Studio Build Tools along with Visual Studio Code to compile, build, and verify any C++ codebase as long as you also have a valid Visual Studio license (either Community, Pro, or Enterprise) that you are actively using to develop that C++ codebase.

3. Open the **Developer Command Prompt for VS** by typing 'developer' in the Windows Start menu.
4. Check your MSVC installation by typing `cl` into the Developer Command Prompt for VS. You should see a copyright message with the version and basic usage description.

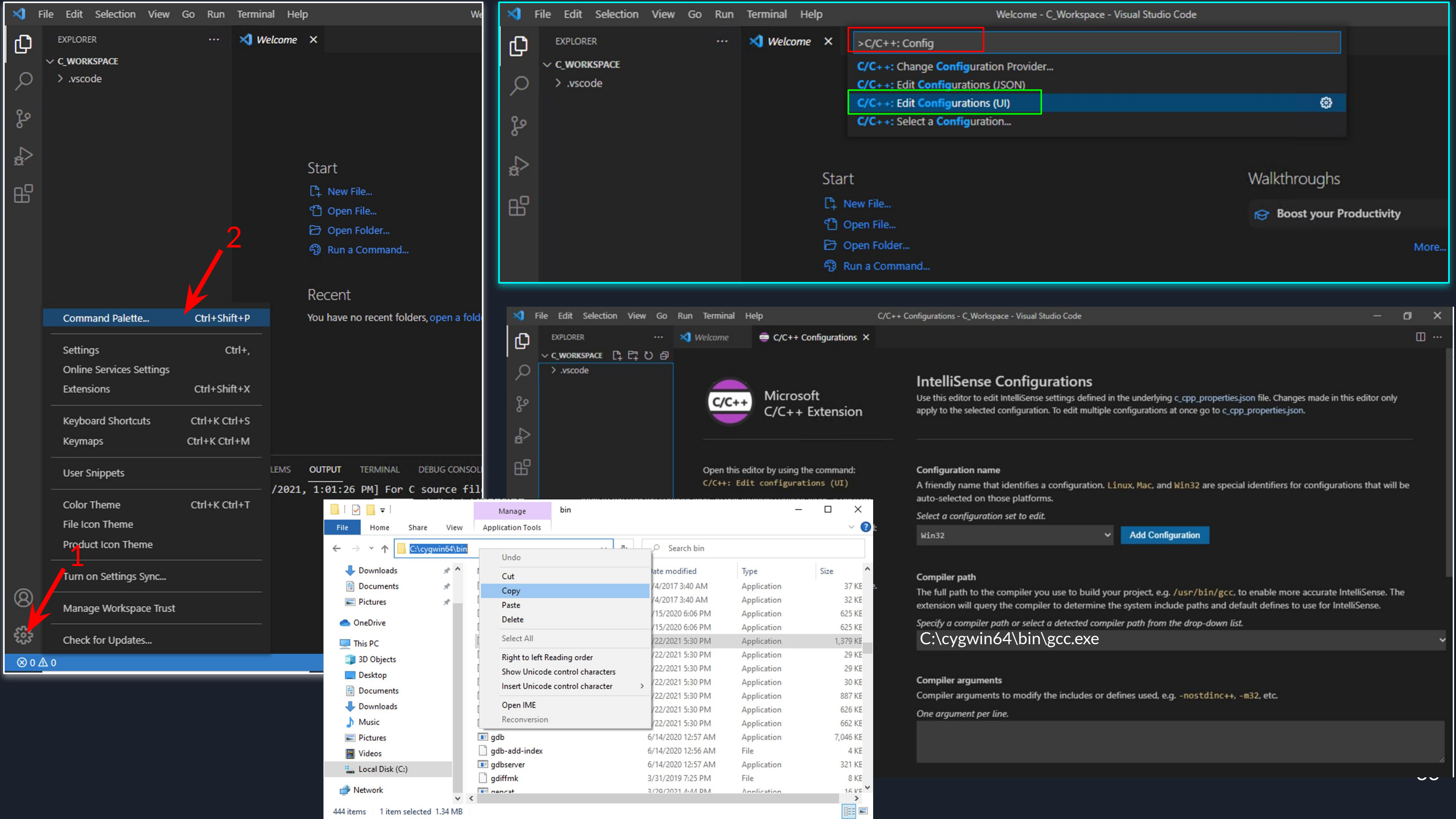
   > **Note**: To use MSVC from the command line or VS Code, you must run from a **Developer Command Prompt for VS**. An ordinary shell such as PowerShell, Bash, or the Windows command prompt does not have the necessary path environment variables set.

Help improve VS Code by allowing Microsoft to collect usage data.


development experience.
Install a C++ compiler
Visual Studio Code
OK
2
Configure C++ IntelliSense

We found the following C++ compilers on your system. Choose a compiler in your project's IntelliSense Configuration.

C:/cygwin64/bin/gcc.exe


File Edit Selection View Go Run Terminal Help
EXPLORER
C_WORKSPACE
.vscode
Welcome
Start
New File...
Open File...
Open Folder...
Run a Command...
Recent
Walkthroughs
Boost your Productivity
More...
2
1
Command Palette... Ctrl+Shift+P
Settings Ctrl+,
Online Services Settings
Extensions Ctrl+Shift+X
Keyboard Shortcuts Ctrl+K Ctrl+S
Keymaps Ctrl+K Ctrl+M
User Snippets
Color Theme Ctrl+K Ctrl+T
File Icon Theme
Product Icon Theme
Turn on Settings Sync...
Manage Workspace Trust
Check for Updates...
LEMS OUTPUT TERMINAL DEBUG CONSOL
Welcome - C_Workspace - Visual Studio Code
C/C++: Change Configuration Provider...
C/C++: Edit Configurations (JSON)
C/C++: Edit Configurations (UI)
C/C++: Select a Configuration...
C/C++ Configurations - C_Workspace - Visual Studio Code
C/C++ Configurations
Microsoft C/C++ Extension
Manage bin
File Home Share View Application Tools
Search bin
Downloads
Documents
Pictures
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Network
Undo
Cut
Copy
Paste
Delete
Select All
Right to left Reading order
Show Unicode control characters
Insert Unicode control character
Open IME
Reconversion
444 items 1 item selected 1.34 MB

You have no recent folders, open a fold

```
/2021, 1:01:26 PM] For C source fil
```

```
>C/C++: Config
```

```
C:\cygwin64\bin
```

	ate modified	Type	Size
	/4/2017 3:40 AM	Application	37 KE
	/4/2017 3:40 AM	Application	32 KE
	/15/2020 6:06 PM	Application	625 KE
	/15/2020 6:06 PM	Application	625 KE
	/22/2021 5:30 PM	Application	1,379 KE
	/22/2021 5:30 PM	Application	29 KE
	/22/2021 5:30 PM	Application	29 KE
	/22/2021 5:30 PM	Application	30 KE
	/22/2021 5:30 PM	Application	887 KE
	/22/2021 5:30 PM	Application	626 KE
	/22/2021 5:30 PM	Application	662 KE
gdb	6/14/2020 12:57 AM	Application	7,046 KE
gdb-add-index	6/14/2020 12:56 AM	File	4 KE
gdbserver	6/14/2020 12:57 AM	Application	321 KE
gdiffmk	3/31/2019 7:25 PM	File	8 KE
gencat	3/29/2021 4:44 PM	Application	16 KE

Open this editor by using the command:
`C/C++: Edit configurations (UI)`

IntelliSense Configurations

Use this editor to edit IntelliSense settings defined in the underlying c_cpp_properties.json file. Changes made in this editor only apply to the selected configuration. To edit multiple configurations at once go to c_cpp_properties.json.

Configuration name

A friendly name that identifies a configuration. `Linux`, `Mac`, and `Win32` are special identifiers for configurations that will be auto-selected on those platforms.

Select a configuration set to edit.

`Win32` Add Configuration

Compiler path

The full path to the compiler you use to build your project, e.g. `/usr/bin/gcc`, to enable more accurate IntelliSense. The extension will query the compiler to determine the system include paths and default defines to use for IntelliSense.

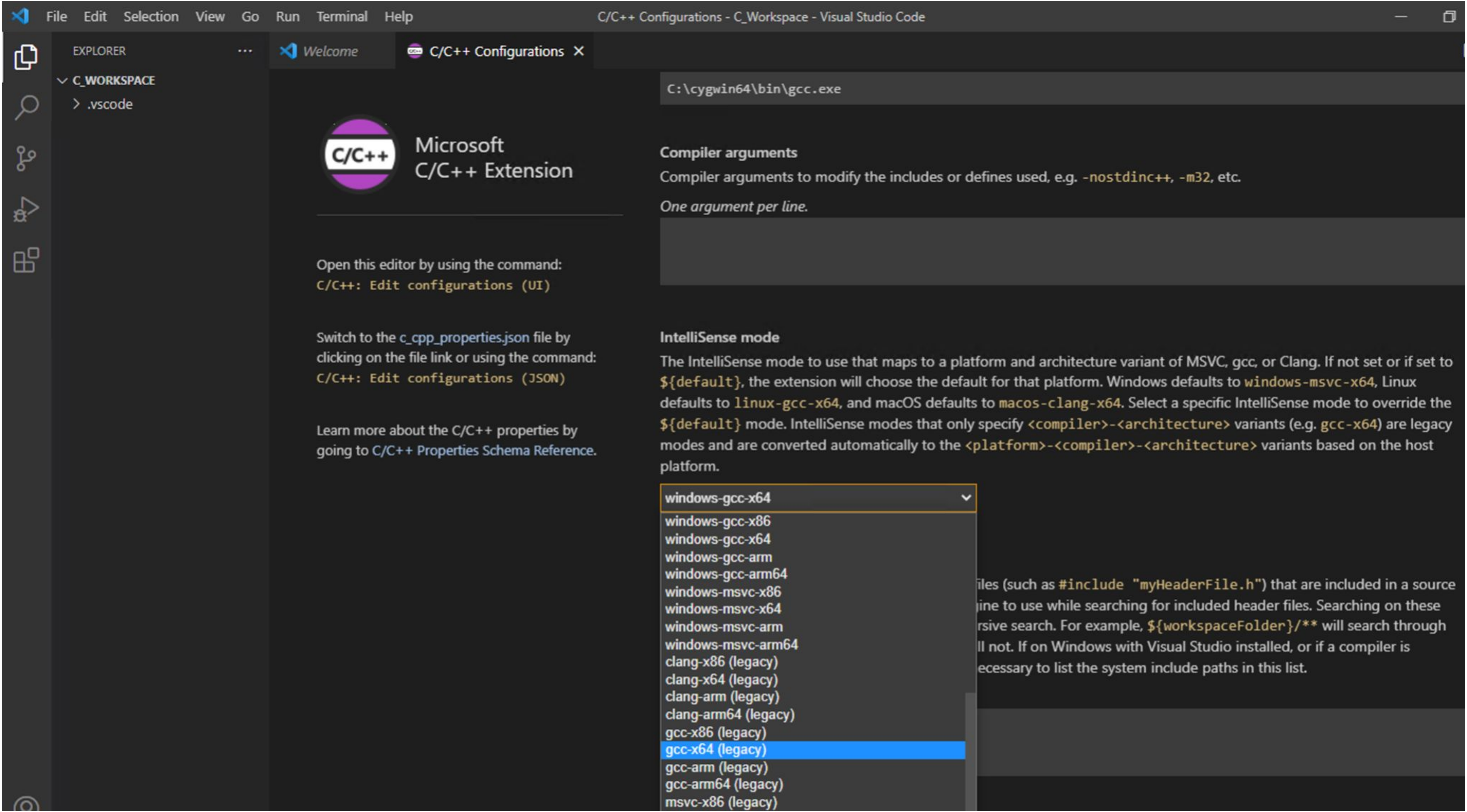
Specify a compiler path or select a detected compiler path from the drop-down list.

C:\cygwin64\bin\gcc.exe

Compiler arguments

Compiler arguments to modify the includes or defines used, e.g. `-nostdinc++`, `-m32`, etc.

One argument per line.


File
Edit
Selection
View
Go
Run
Terminal
Help
C/C++ Configurations - C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
Welcome
C/C++ Configurations
C/C++
Microsoft
C/C++ Extension

Open this editor by using the command:
`C/C++: Edit configurations (UI)`

Switch to the c_cpp_properties.json file by clicking on the file link or using the command:
`C/C++: Edit configurations (JSON)`

Learn more about the C/C++ properties by going to C/C++ Properties Schema Reference.

```
C:\cygwin64\bin\gcc.exe
```

Compiler arguments

Compiler arguments to modify the includes or defines used, e.g. `-nostdinc++`, `-m32`, etc.

One argument per line.

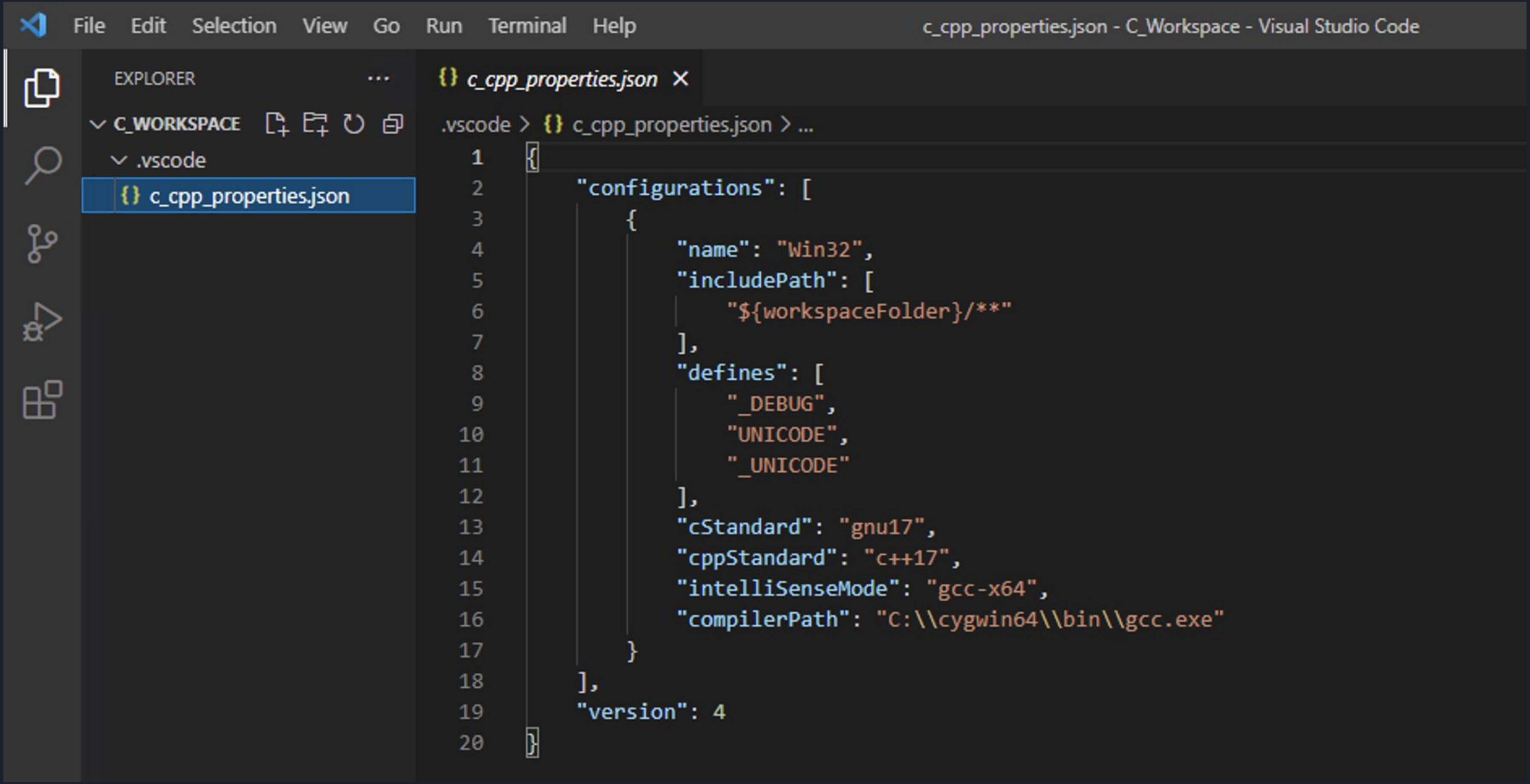
IntelliSense mode

The IntelliSense mode to use that maps to a platform and architecture variant of MSVC, gcc, or Clang. If not set or if set to `${default}`, the extension will choose the default for that platform. Windows defaults to `windows-msvc-x64`, Linux defaults to `linux-gcc-x64`, and macOS defaults to `macos-clang-x64`. Select a specific IntelliSense mode to override the `${default}` mode. IntelliSense modes that only specify `<compiler>-<architecture>` variants (e.g. `gcc-x64`) are legacy modes and are converted automatically to the `<platform>-<compiler>-<architecture>` variants based on the host platform.

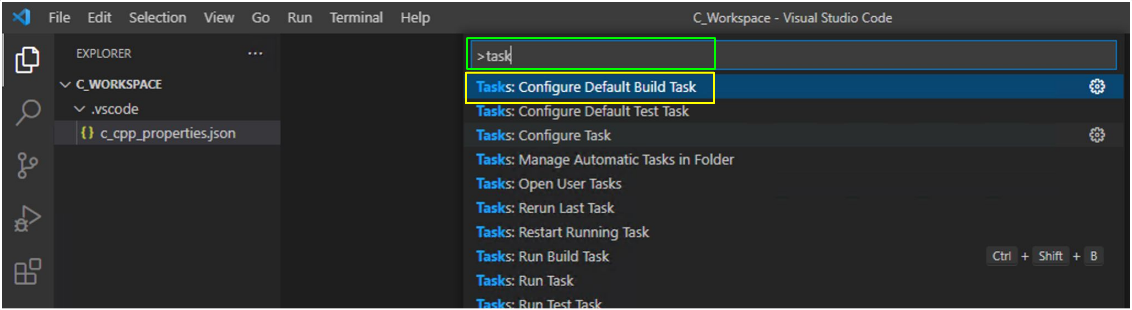
windows-gcc-x64

- windows-gcc-x86
- windows-gcc-x64
- windows-gcc-arm
- windows-gcc-arm64
- windows-msvc-x86
- windows-msvc-x64
- windows-msvc-arm
- windows-msvc-arm64
- clang-x86 (legacy)
- clang-x64 (legacy)
- clang-arm (legacy)
- clang-arm64 (legacy)
- gcc-x86 (legacy)
- gcc-x64 (legacy)
- gcc-arm (legacy)
- gcc-arm64 (legacy)
- msvc-x86 (legacy)

iles (such as `#include "myHeaderFile.h"`) that are included in a source
ine to use while searching for included header files. Searching on these
rsive search. For example, `${workspaceFolder}/**` will search through
ll not. If on Windows with Visual Studio installed, or if a compiler is
ecessary to list the system include paths in this list.

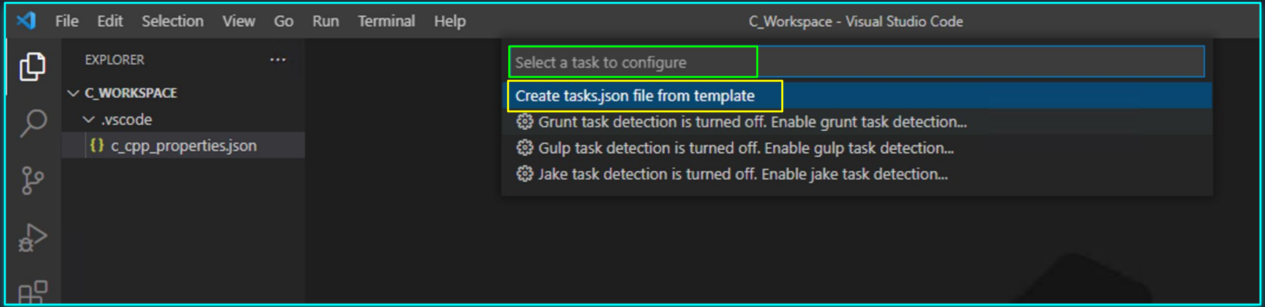

File
Edit
Selection
View
Go
Run
Terminal
Help
c_cpp_properties.json - C_Workspace - Visual Studio Code
EXPLORER
...
C_WORKSPACE
.vscode
{} c_cpp_properties.json
{} c_cpp_properties.json ×
.vscode > {} c_cpp_properties.json > ...

```
{
    "configurations": [
        {
            "name": "Win32",
            "includePath": [
                "${workspaceFolder}/**"
            ],
            "defines": [
                "_DEBUG",
                "UNICODE",
                "_UNICODE"
            ],
            "cStandard": "gnu17",
            "cppStandard": "c++17",
            "intelliSenseMode": "gcc-x64",
            "compilerPath": "C:\\cygwin64\\bin\\gcc.exe"
        }
    ],
    "version": 4
}
```


File Edit Selection View Go Run Terminal Help
C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json

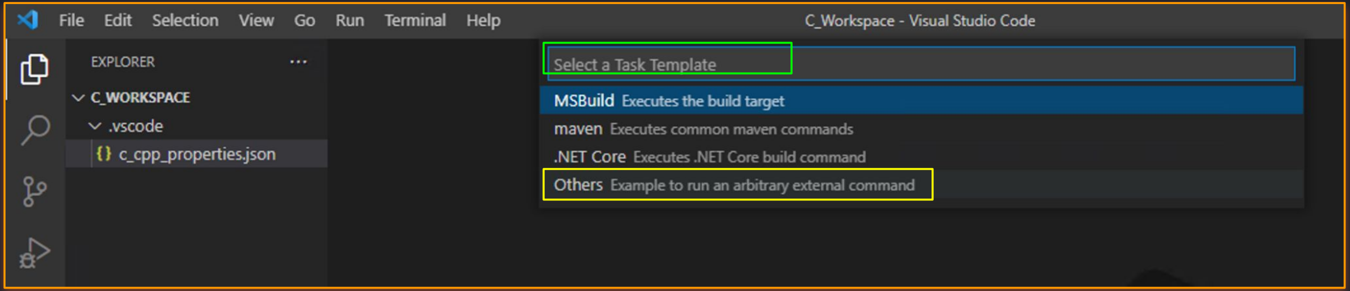
>task

- Tasks: Configure Default Build Task
- Tasks: Configure Default Test Task
- Tasks: Configure Task
- Tasks: Manage Automatic Tasks in Folder
- Tasks: Open User Tasks
- Tasks: Rerun Last Task
- Tasks: Restart Running Task
- Tasks: Run Build Task Ctrl + Shift + B
- Tasks: Run Task
- Tasks: Run Test Task


File Edit Selection View Go Run Terminal Help
C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json

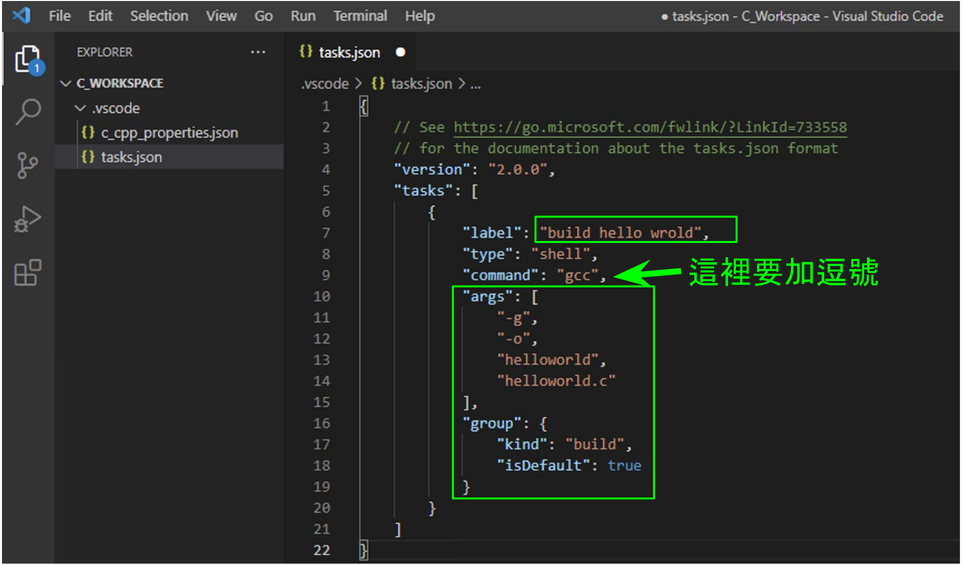
Select a task to configure

- Create tasks.json file from template
- Grunt task detection is turned off. Enable grunt task detection...
- Gulp task detection is turned off. Enable gulp task detection...
- Jake task detection is turned off. Enable jake task detection...


File Edit Selection View Go Run Terminal Help
C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json

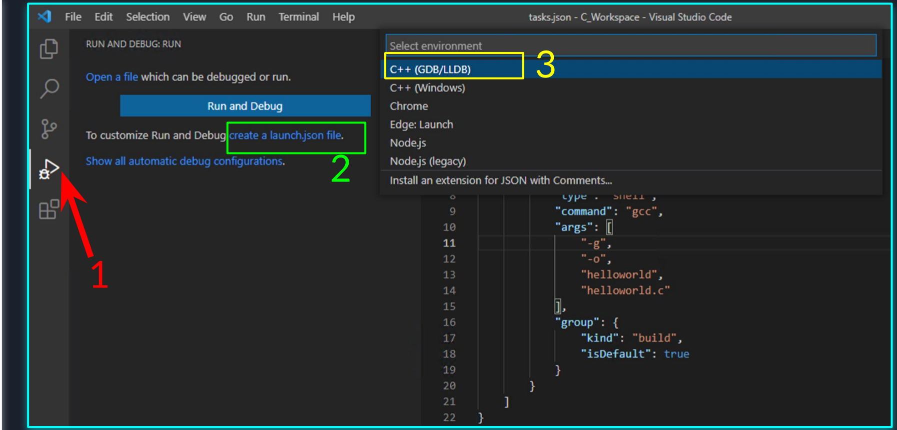
Select a Task Template

- MSBuild Executes the build target
- maven Executes common maven commands
- .NET Core Executes .NET Core build command
- Others Example to run an arbitrary external command


File Edit Selection View Go Run Terminal Help
● tasks.json - C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json
tasks.json
.vscode > {} tasks.json > ...

```
{
    // See https://go.microsoft.com/fwlink/?LinkId=733558
    // for the documentation about the tasks.json format
    "version": "2.0.0",
    "tasks": [
        {
            "label": "build hello wrold",
            "type": "shell",
            "command": "gcc",
            "args": [
                "-g",
                "-o",
                "helloworld",
                "helloworld.c"
            ],
            "group": {
                "kind": "build",
                "isDefault": true
            }
        }
    ]
}
```

這裡要加逗號

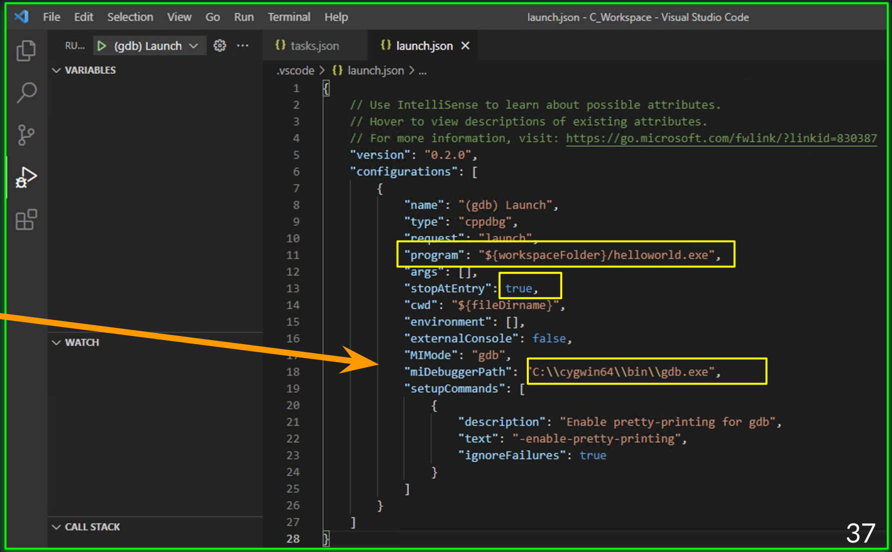

File Edit Selection View Go Run Terminal Help
tasks.json - C_Workspace - Visual Studio Code
RUN AND DEBUG: RUN
Run and Debug
Select environment
C++ (GDB/LLDB)
C++ (Windows)
Chrome
Edge: Launch
Node.js
Node.js (legacy)
Install an extension for JSON with Comments...
1
2
3

Open a file which can be debugged or run.

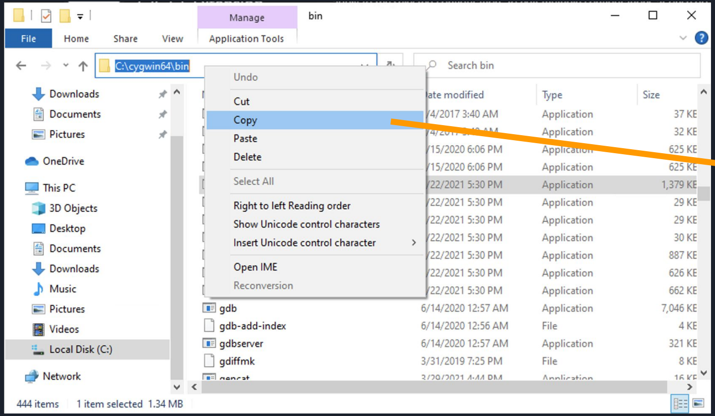
To customize Run and Debug create a launch.json file.

Show all automatic debug configurations.

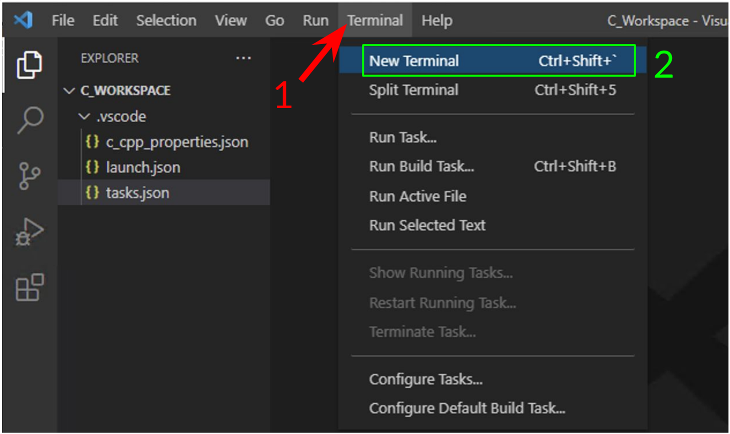
```
            "command": "gcc",
            "args": [
                "-g",
                "-o",
                "helloworld",
                "helloworld.c"
            ],
            "group": {
                "kind": "build",
                "isDefault": true
            }
        }
    ]
}
```

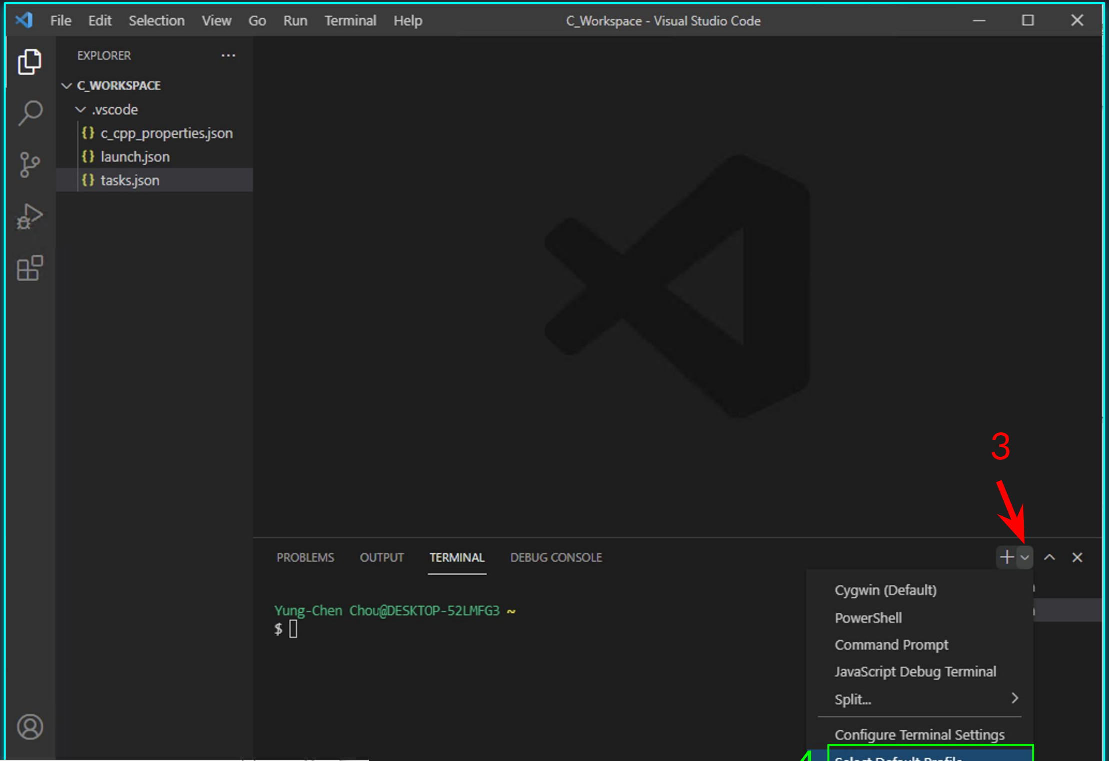

File Edit Selection View Go Run Terminal Help
launch.json - C_Workspace - Visual Studio Code
RU... (gdb) Launch
tasks.json
launch.json
VARIABLES
WATCH
CALL STACK
.vscode > {} launch.json > ...

```
{
    // Use IntelliSense to learn about possible attributes.
    // Hover to view descriptions of existing attributes.
    // For more information, visit: https://go.microsoft.com/fwlink/?linkid=830387
    "version": "0.2.0",
    "configurations": [
        {
            "name": "(gdb) Launch",
            "type": "cppdbg",
            "request": "launch",
            "program": "${workspaceFolder}/helloworld.exe",
            "args": [],
            "stopAtEntry": true,
            "cwd": "${fileDirname}",
            "environment": [],
            "externalConsole": false,
            "MIMode": "gdb",
            "miDebuggerPath": "C:\\cygwin64\\bin\\gdb.exe",
            "setupCommands": [
                {
                    "description": "Enable pretty-printing for gdb",
                    "text": "-enable-pretty-printing",
                    "ignoreFailures": true
                }
            ]
        }
    ]
}
```

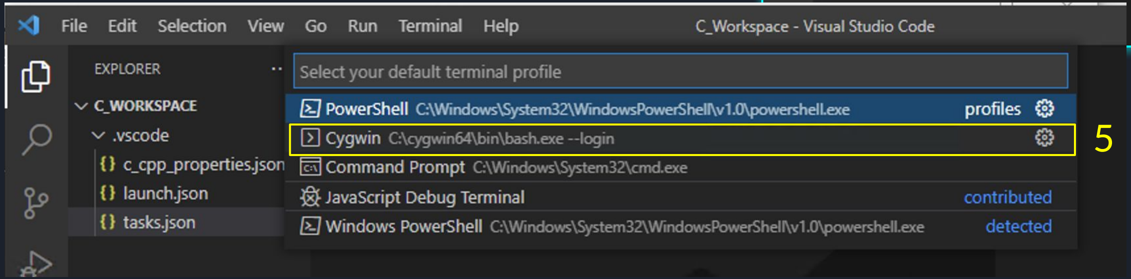

Manage
bin
File Home Share View Application Tools
C:\cygwin64\bin
Search bin
Undo
Cut
Copy
Paste
Delete
Select All
Right to left Reading order
Show Unicode control characters
Insert Unicode control character
Open IME
Reconversion
Downloads
Documents
Pictures
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Network
444 items 1 item selected 1.34 MB

Name	Date modified	Type	Size
gdb	6/14/2020 12:57 AM	Application	7,046 KE
gdb-add-index	6/14/2020 12:56 AM	File	4 KE
gdbserver	6/14/2020 12:57 AM	Application	321 KE
gdiffmk	3/31/2019 7:25 PM	File	8 KE


File Edit Selection View Go Run Terminal Help C_Workspace - Visu
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json
launch.json
tasks.json
1
2
New Terminal Ctrl+Shift+`
Split Terminal Ctrl+Shift+5
Run Task...
Run Build Task... Ctrl+Shift+B
Run Active File
Run Selected Text
Show Running Tasks...
Restart Running Task...
Terminate Task...
Configure Tasks...
Configure Default Build Task...

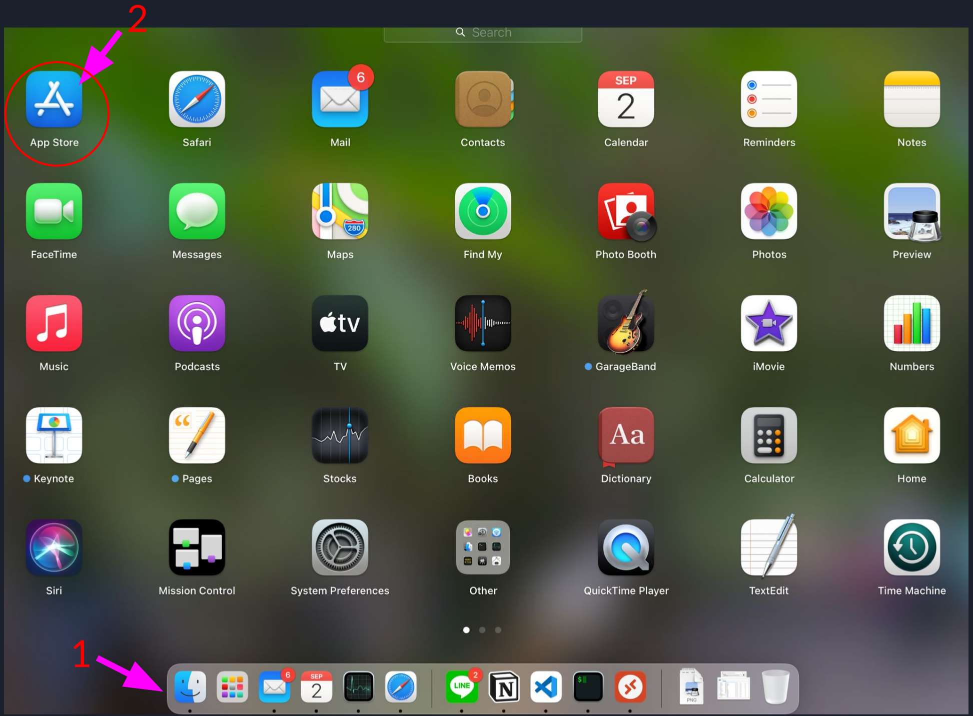

File Edit Selection View Go Run Terminal Help C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json
launch.json
tasks.json
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
3
Cygwin (Default)
PowerShell
Command Prompt
JavaScript Debug Terminal
Split...
Configure Terminal Settings
4
Select Default Profile

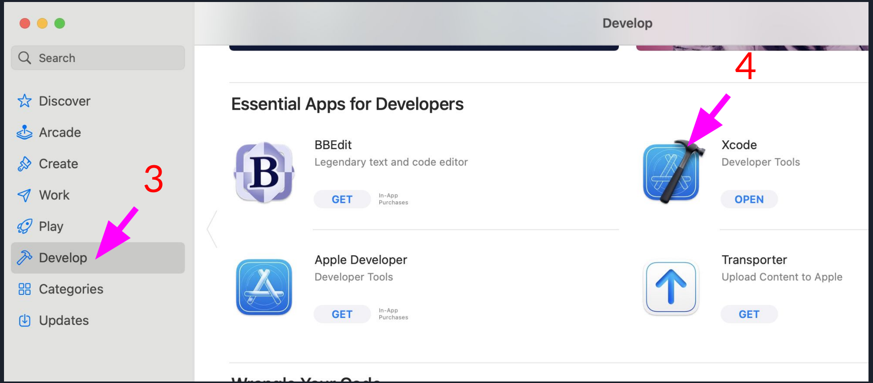
```
Yung-Chen Chou@DESKTOP-52LMFG3 ~
$ 
```

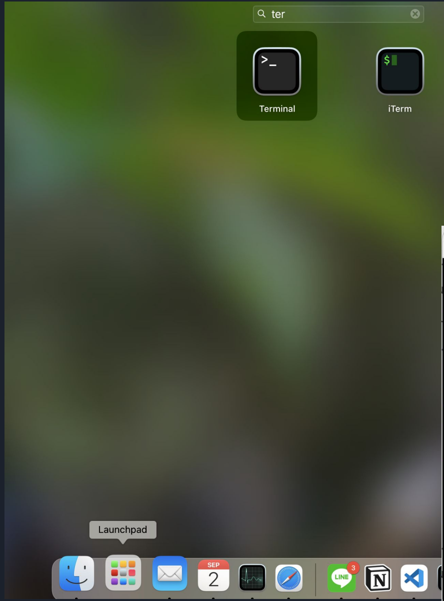

File Edit Selection View Go Run Terminal Help C_Workspace - Visual Studio Code
EXPLORER
C_WORKSPACE
.vscode
c_cpp_properties.json
launch.json
tasks.json
Select your default terminal profile
PowerShell C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe profiles
Cygwin C:\cygwin64\bin\bash.exe --login
5
Command Prompt C:\Windows\System32\cmd.exe
JavaScript Debug Terminal contributed
Windows PowerShell C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe detected

Coding Environment

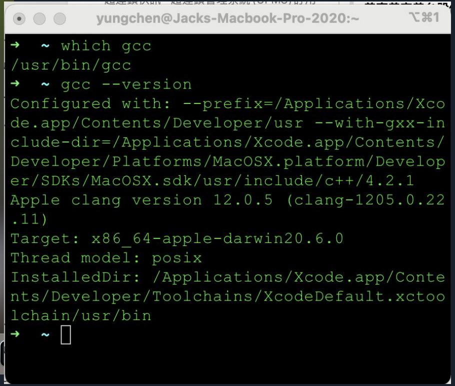
Mac


2
Search
App Store
Safari
Mail
Contacts
Calendar
Reminders
Notes
FaceTime
Messages
Maps
Find My
Photo Booth
Photos
Preview
Music
Podcasts
TV
Voice Memos
GarageBand
iMovie
Numbers
Keynote
Pages
Stocks
Books
Dictionary
Calculator
Home
Siri
Mission Control
System Preferences
Other
QuickTime Player
TextEdit
Time Machine
1


Develop
Search
Discover
Arcade
Create
Work
Play
Develop
Categories
Updates
3
4
Essential Apps for Developers
BBEdit
Legendary text and code editor
GET
In-App Purchases
Xcode
Developer Tools
OPEN
Apple Developer
Developer Tools
GET
In-App Purchases
Transporter
Upload Content to Apple
GET


ter
Terminal
iTerm
Launchpad

使用 終端機 程式並用 which gcc 查看 gcc 所在的路徑，再使用 gcc --version 指令查看是否有版本資訊，如果你的 Mac 尚未安裝 gcc 它會自動跳出安裝對話框進行安裝

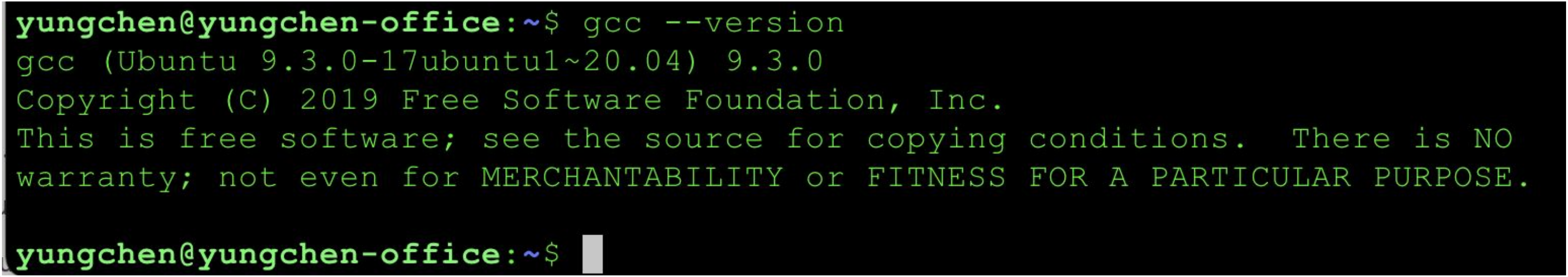

yungchen@Jacks-Macbook-Pro-2020:~
⌥⌘1

```
➜  ~ which gcc
/usr/bin/gcc
➜  ~ gcc --version
Configured with: --prefix=/Applications/Xco
de.app/Contents/Developer/usr --with-gxx-in
clude-dir=/Applications/Xcode.app/Contents/
Developer/Platforms/MacOSX.platform/Develop
er/SDKs/MacOSX.sdk/usr/include/c++/4.2.1
Apple clang version 12.0.5 (clang-1205.0.22
.11)
Target: x86_64-apple-darwin20.6.0
Thread model: posix
InstalledDir: /Applications/Xcode.app/Conte
nts/Developer/Toolchains/XcodeDefault.xctoo
lchain/usr/bin
➜  ~ 
```

Coding Environment

Linux (ex: Ubuntu 20.04)

- Please browse the web page https://linuxize.com/post/how-to-install-gcc-on-ubuntu-20-04/ and follow the instructions to install the gcc on your computer



```
yungchen@yungchen-office:~$ gcc --version
gcc (Ubuntu 9.3.0-17ubuntu1~20.04) 9.3.0
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This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

yungchen@yungchen-office:~$ 
```