Guía Instalación C con OPENMP & MPI

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Created time	@September 2, 2025 2:54 PM
Select	Unidad1
Tags	C ComputacionConcurrente ComputacionDistribuida ComputacionParalela ConceptosBasicos

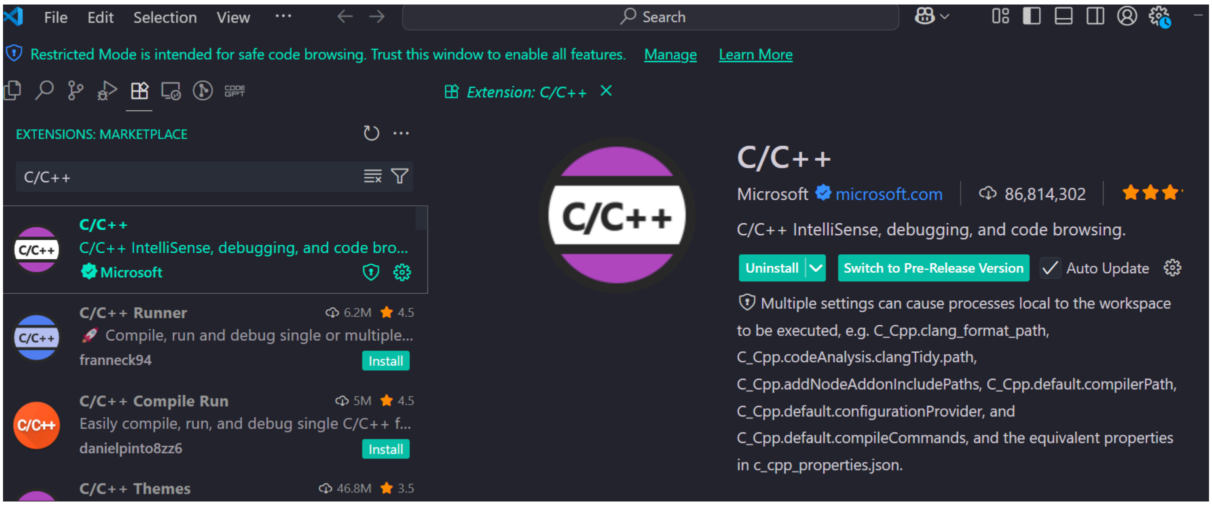
Guía de Instalación y Configuración🏷️

1. Instalar Visual Studio Code

1. Descargar **Visual Studio Code** desde:

   https://code.visualstudio.com/

2. Instalar con las opciones por defecto.
3. Instalar en VS Code las extensiones:
   - **C/C++** (Microsoft)
   - **C/C++** Snippets
   - **Code Runner** (opcional, para ejecutar más fácil)



Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn More

C/C++

C/C++
C/C++ IntelliSense, debugging, and code bro...
Microsoft

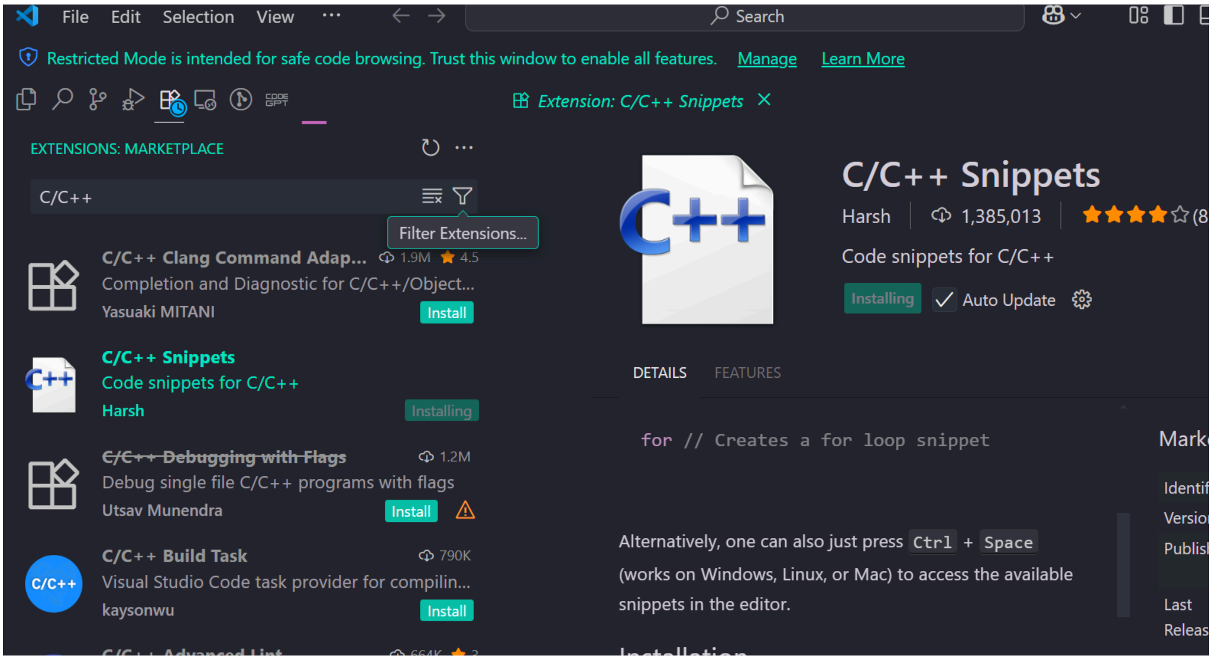
C/C++ Runner 6.2M 4.5
Compile, run and debug single or multiple...
franneck94

C/C++ Compile Run 5M 4.5
Easily compile, run, and debug single C/C++ f...
danielpinto8zz6

C/C++ Themes 46.8M 3.5

C/C++
Microsoft microsoft.com 86,814,302
C/C++ IntelliSense, debugging, and code browsing.

Multiple settings can cause processes local to the workspace to be executed, e.g. C_Cpp.clang_format_path, C_Cpp.codeAnalysis.clangTidy.path, C_Cpp.addNodeAddonIncludePaths, C_Cpp.default.compilerPath, C_Cpp.default.configurationProvider, and C_Cpp.default.compileCommands, and the equivalent properties in c_cpp_properties.json.



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C/C++

C/C++ Clang Command Adap... 1.9M 4.5
Completion and Diagnostic for C/C++/Object...
Yasuaki MITANI

C/C++ Snippets
Code snippets for C/C++
Harsh

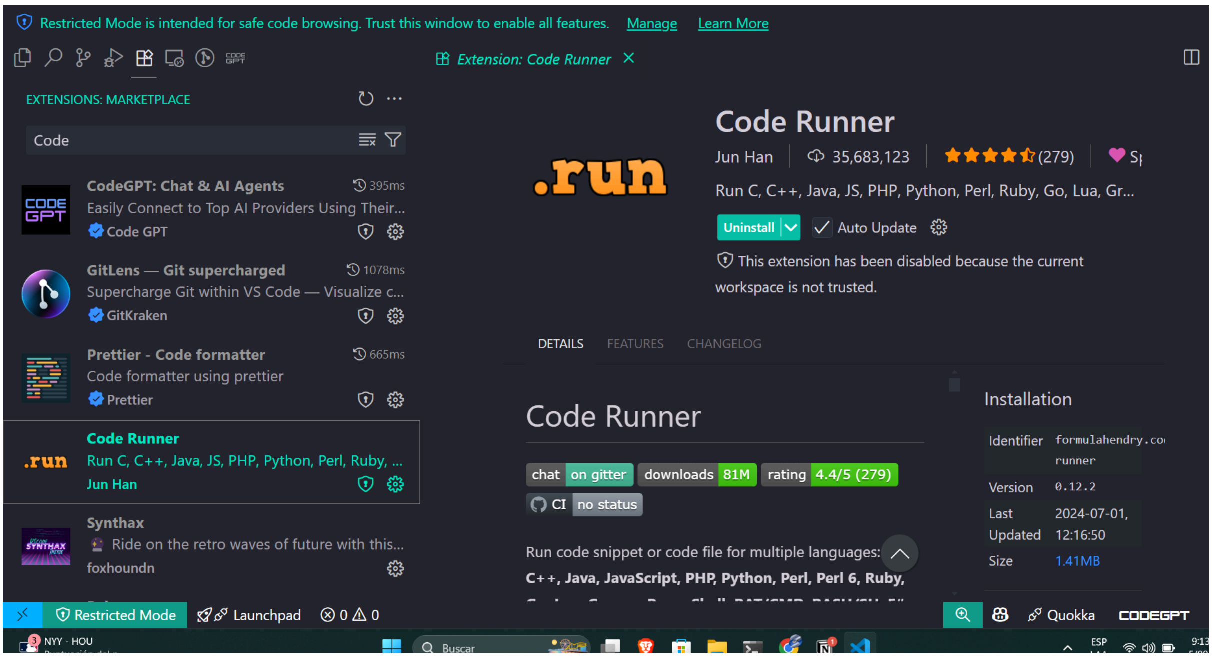
~~C/C++ Debugging with Flags~~ 1.2M
Debug single file C/C++ programs with flags
Utsav Munendra

C/C++ Build Task 790K
Visual Studio Code task provider for compilin...
kaysonwu

C/C++ Snippets
Harsh 1,385,013
Code snippets for C/C++

```
for // Creates a for loop snippet
```

Alternatively, one can also just press `Ctrl` + `Space` (works on Windows, Linux, or Mac) to access the available snippets in the editor.



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EXTENSIONS: MARKETPLACE

Code

CodeGPT: Chat & AI Agents 395ms
Easily Connect to Top AI Providers Using Their...
Code GPT

GitLens — Git supercharged 1078ms
Supercharge Git within VS Code — Visualize c...
GitKraken

Prettier - Code formatter 665ms
Code formatter using prettier
Prettier

Code Runner
Run C, C++, Java, JS, PHP, Python, Perl, Ruby, ...
Jun Han

Synthax
Ride on the retro waves of future with this...
foxhoundn

Code Runner
Jun Han | 35,683,123 | ★★★★☆ (279)
Run C, C++, Java, JS, PHP, Python, Perl, Ruby, Go, Lua, Gr...

Uninstall ✓ Auto Update

This extension has been disabled because the current workspace is not trusted.

Code Runner

chat on gitter | downloads 81M | rating 4.4/5 (279)
CI no status

Run code snippet or code file for multiple languages: C++, Java, JavaScript, PHP, Python, Perl, Perl 6, Ruby,

Installation

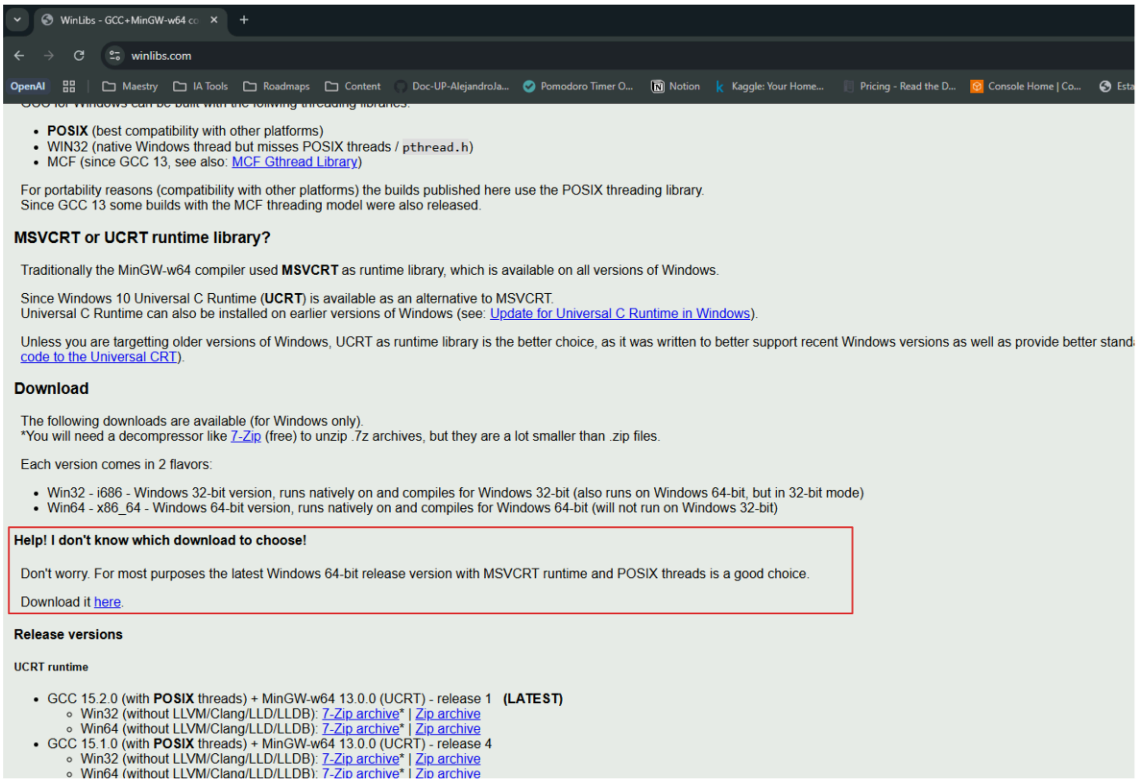
Identifier	formulahendry.co runner
Version	0.12.2
Last Updated	2024-07-01, 12:16:50
Size	1.41MB

2. Instalar compilador C/C++ con Soporte OPENMP

1. Descargar WinLibs MinGW-w64 con GCC desde:

   a. https://winlibs.com/

   (elegir versión de 64 bits con GCC 13.x o superior)



- **POSIX** (best compatibility with other platforms)
- WIN32 (native Windows thread but misses POSIX threads / `pthread.h`)
- MCF (since GCC 13, see also: MCF Gthread Library)

For portability reasons (compatibility with other platforms) the builds published here use the POSIX threading library.
Since GCC 13 some builds with the MCF threading model were also released.

MSVCRT or UCRT runtime library?

Traditionally the MinGW-w64 compiler used **MSVCRT** as runtime library, which is available on all versions of Windows.

Since Windows 10 Universal C Runtime (**UCRT**) is available as an alternative to MSVCRT.
Universal C Runtime can also be installed on earlier versions of Windows (see: Update for Universal C Runtime in Windows).

Unless you are targetting older versions of Windows, UCRT as runtime library is the better choice, as it was written to better support recent Windows versions as well as provide better stand
code to the Universal CRT).

Download

The following downloads are available (for Windows only).
*You will need a decompressor like 7-Zip (free) to unzip .7z archives, but they are a lot smaller than .zip files.

Each version comes in 2 flavors:

- Win32 - i686 - Windows 32-bit version, runs natively on and compiles for Windows 32-bit (also runs on Windows 64-bit, but in 32-bit mode)
- Win64 - x86_64 - Windows 64-bit version, runs natively on and compiles for Windows 64-bit (will not run on Windows 32-bit)

Help! I don't know which download to choose!

Don't worry. For most purposes the latest Windows 64-bit release version with MSVCRT runtime and POSIX threads is a good choice.

Download it here.

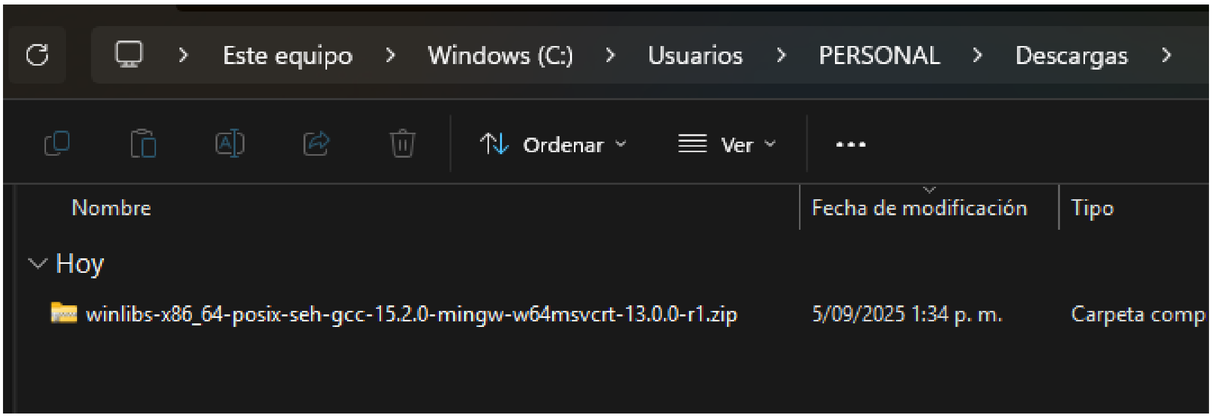
Release versions

UCRT runtime

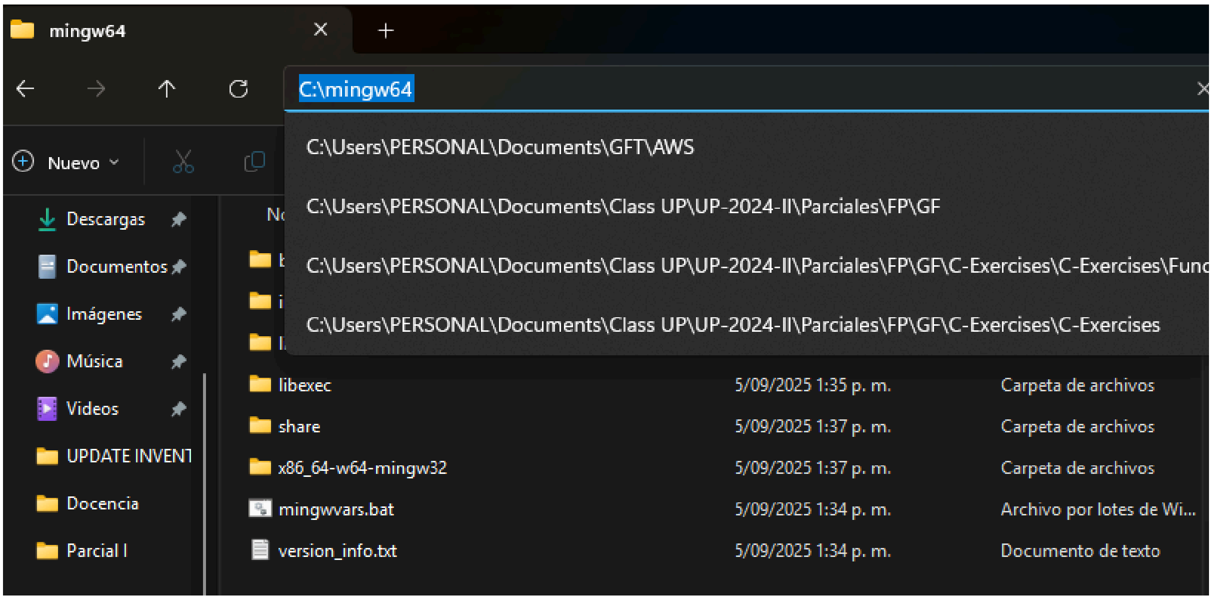
- GCC 15.2.0 (with **POSIX** threads) + MinGW-w64 13.0.0 (UCRT) - release 1 **(LATEST)**
  - Win32 (without LLVM/Clang/LLD/LLDB): 7-Zip archive* | Zip archive
  - Win64 (without LLVM/Clang/LLD/LLDB): 7-Zip archive* | Zip archive
- GCC 15.1.0 (with **POSIX** threads) + MinGW-w64 13.0.0 (UCRT) - release 4
  - Win32 (without LLVM/Clang/LLD/LLDB): 7-Zip archive* | Zip archive
  - Win64 (without LLVM/Clang/LLD/LLDB): 7-Zip archive* | Zip archive

2. Instalar en: ***C:\mingw64***

   a. Clic derecho, extraer todo (elegir ubicación)



winlibs-x86_64-posix-seh-gcc-15.2.0-mingw-w64msvcrt-13.0.0-r1.zip 5/09/2025 1:34 p. m. Carpeta comp



C:\mingw64

C:\Users\PERSONAL\Documents\GFT\AWS

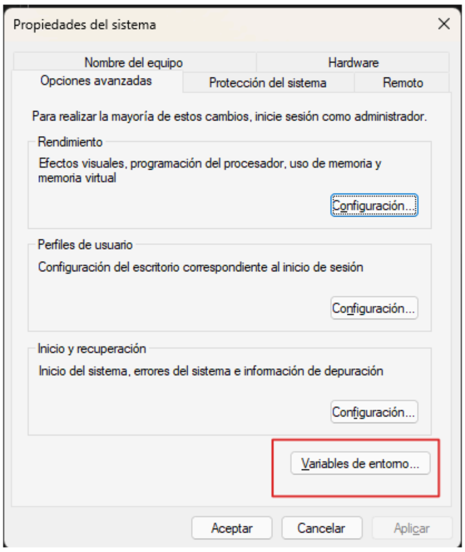
C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF

C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF\C-Exercises\C-Exercises\Func

C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF\C-Exercises\C-Exercises

libexec	5/09/2025 1:35 p. m.	Carpeta de archivos
share	5/09/2025 1:37 p. m.	Carpeta de archivos
x86_64-w64-mingw32	5/09/2025 1:37 p. m.	Carpeta de archivos
mingwvars.bat	5/09/2025 1:34 p. m.	Archivo por lotes de Wi...
version_info.txt	5/09/2025 1:34 p. m.	Documento de texto

- se recomienda no usar rutas con espacios).
- Agregar la ruta del compilador a la variable de entorno **PATH**:
    - Abrir *Panel de Control → Sistema → Configuración avanzada → Variables de entorno*.



Para realizar la mayoría de estos cambios, inicie sesión como administrador.

Rendimiento

Efectos visuales, programación del procesador, uso de memoria y memoria virtual

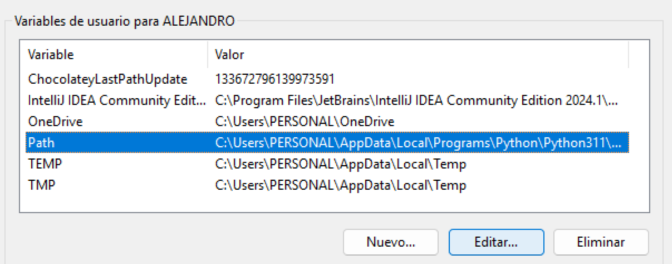
Perfiles de usuario

Configuración del escritorio correspondiente al inicio de sesión

Inicio y recuperación

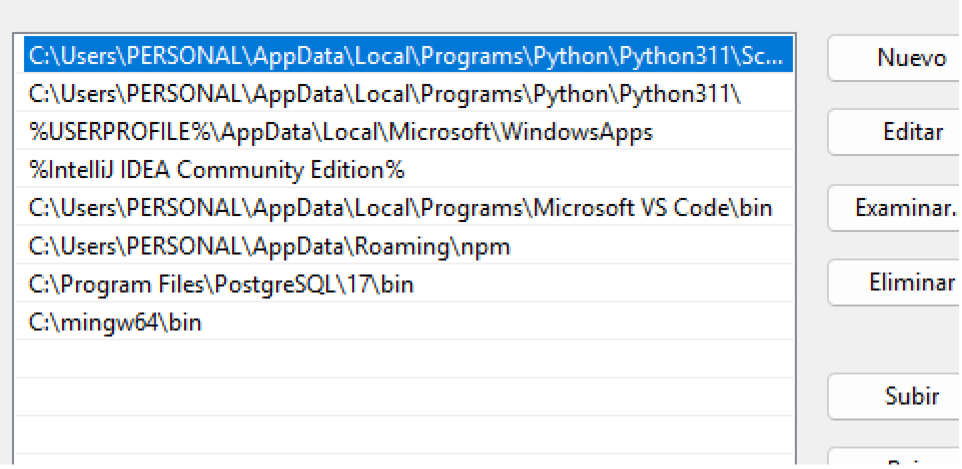
Inicio del sistema, errores del sistema e información de depuración

    - Editar la variable "Path" y agregar: ***C:\mingw-w64\bin***



Variables de usuario para ALEJANDRO

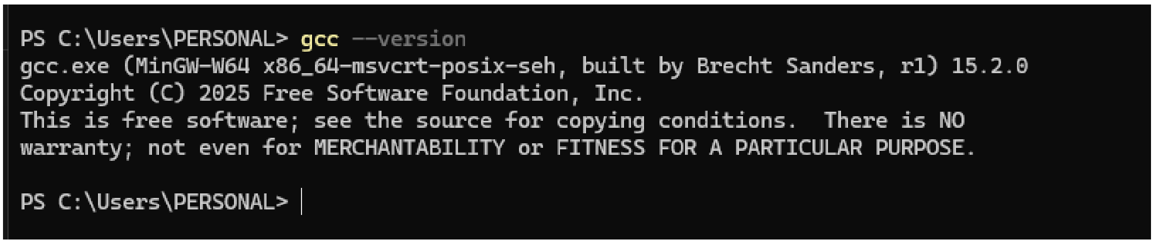
Variable	Valor
ChocolateyLastPathUpdate	133672796139973591
IntelliJ IDEA Community Edit...	C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.1\...
OneDrive	C:\Users\PERSONAL\OneDrive
Path	C:\Users\PERSONAL\AppData\Local\Programs\Python\Python311\...
TEMP	C:\Users\PERSONAL\AppData\Local\Temp
TMP	C:\Users\PERSONAL\AppData\Local\Temp



```
C:\Users\PERSONAL\AppData\Local\Programs\Python\Python311\Sc...
C:\Users\PERSONAL\AppData\Local\Programs\Python\Python311\
%USERPROFILE%\AppData\Local\Microsoft\WindowsApps
%IntelliJ IDEA Community Edition%
C:\Users\PERSONAL\AppData\Local\Programs\Microsoft VS Code\bin
C:\Users\PERSONAL\AppData\Roaming\npm
C:\Program Files\PostgreSQL\17\bin
C:\mingw64\bin
```

- Verificar en la terminal (PowerShell o CMD):

```
gcc --version
```



```
PS C:\Users\PERSONAL> gcc --version
gcc.exe (MinGW-W64 x86_64-msvcrt-posix-seh, built by Brecht Sanders, r1) 15.2.0
Copyright (C) 2025 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.

PS C:\Users\PERSONAL> |
```

3. Configurar y probar OpenMP

1. Recordar que OpenMP ya está incluido en GCC.
2. Compilar con la opción `fopenmp`:

```
gcc -fopenmp omp_00_test.c -o omp_00_test.exe
```

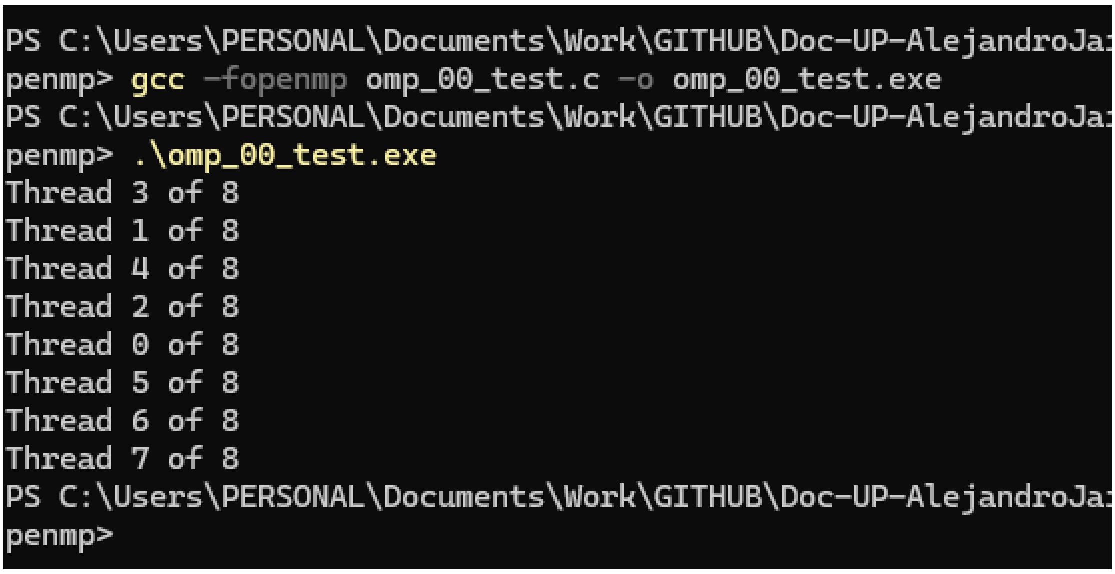
3. Probar con un programa mínimo:

```
#include <stdio.h>
#include <omp.h>
```

```
int main() {
    #pragma omp parallel
    {
        int totalThreads = omp_get_num_threads();
        int threadNum = omp_get_thread_num();
        printf("Thread %d of %d \n", threadNum, totalThreads);
    }
    return 0;
}
```

4. Ejecutar:

```
.\omp_00_test.exe
```

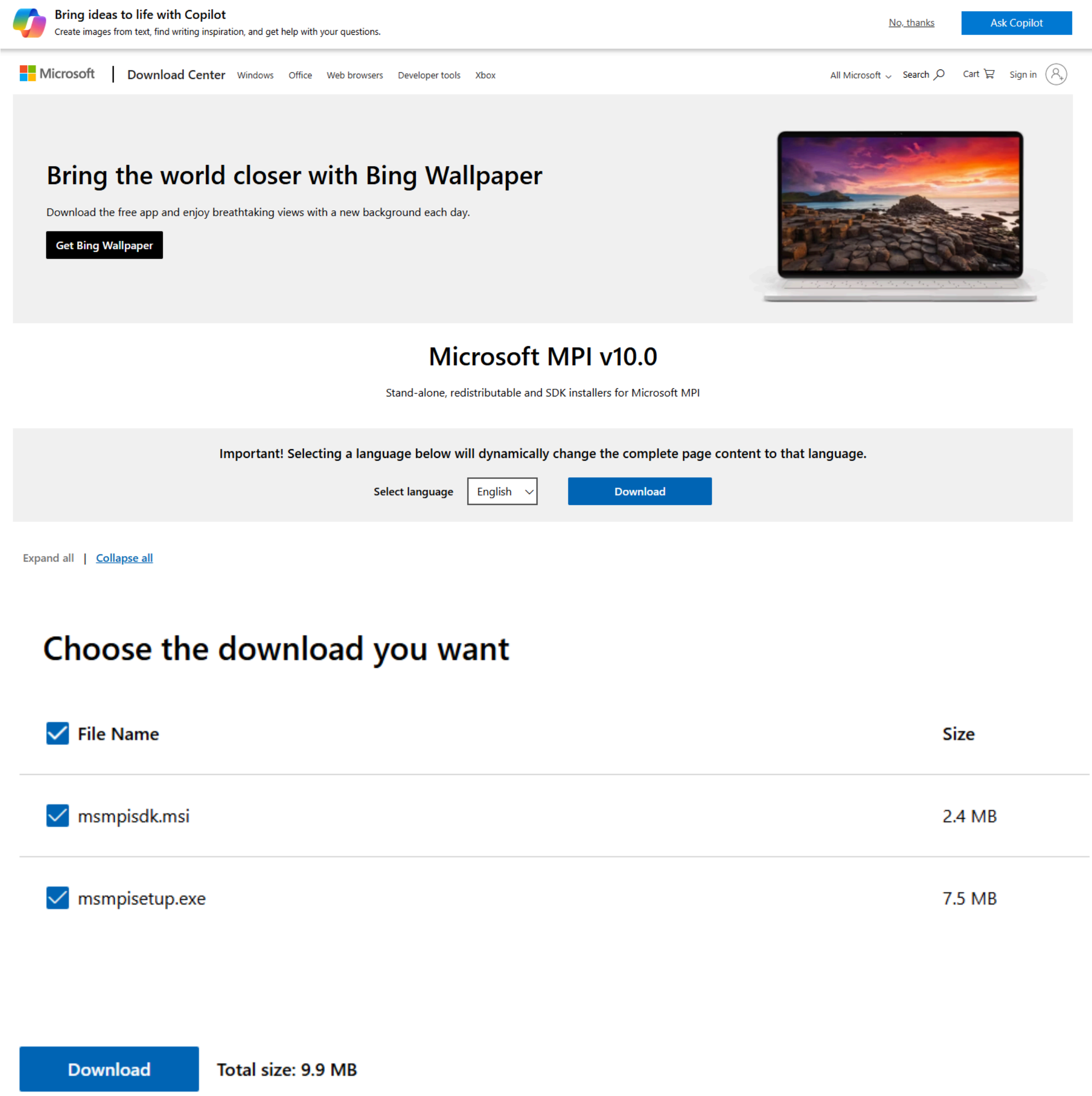


```
PS C:\Users\PERSONAL\Documents\Work\GITHUB\Doc-UP-AlejandroJa
penmp> gcc -fopenmp omp_00_test.c -o omp_00_test.exe
PS C:\Users\PERSONAL\Documents\Work\GITHUB\Doc-UP-AlejandroJa
penmp> .\omp_00_test.exe
Thread 3 of 8
Thread 1 of 8
Thread 4 of 8
Thread 2 of 8
Thread 0 of 8
Thread 5 of 8
Thread 6 of 8
Thread 7 of 8
PS C:\Users\PERSONAL\Documents\Work\GITHUB\Doc-UP-AlejandroJa
penmp>
```

4. Instalar Microsoft MPI

1. Descargar e instalar:

- **MS-MPI Runtime** 👉 Microsoft MPI Runtime
- **MS-MPI SDK** 👉 Microsoft MPI SDK



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Microsoft MPI v10.0

Stand-alone, redistributable and SDK installers for Microsoft MPI

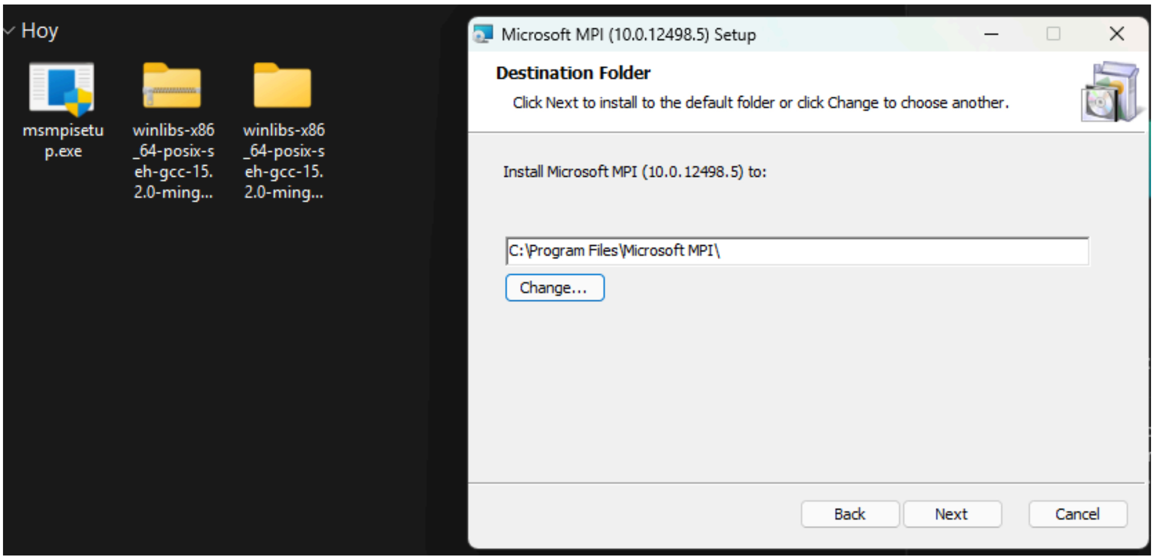
Important! Selecting a language below will dynamically change the complete page content to that language.

Select language: English

Choose the download you want

☑ File Name	Size
☑ msmpisdk.msi	2.4 MB
☑ msmpisetup.exe	7.5 MB

Total size: 9.9 MB



Hoy
msmpisetup.exe
winlibs-x86_64-posix-seh-gcc-15.2.0-ming...
winlibs-x86_64-posix-seh-gcc-15.2.0-ming...

Microsoft MPI (10.0.12498.5) Setup

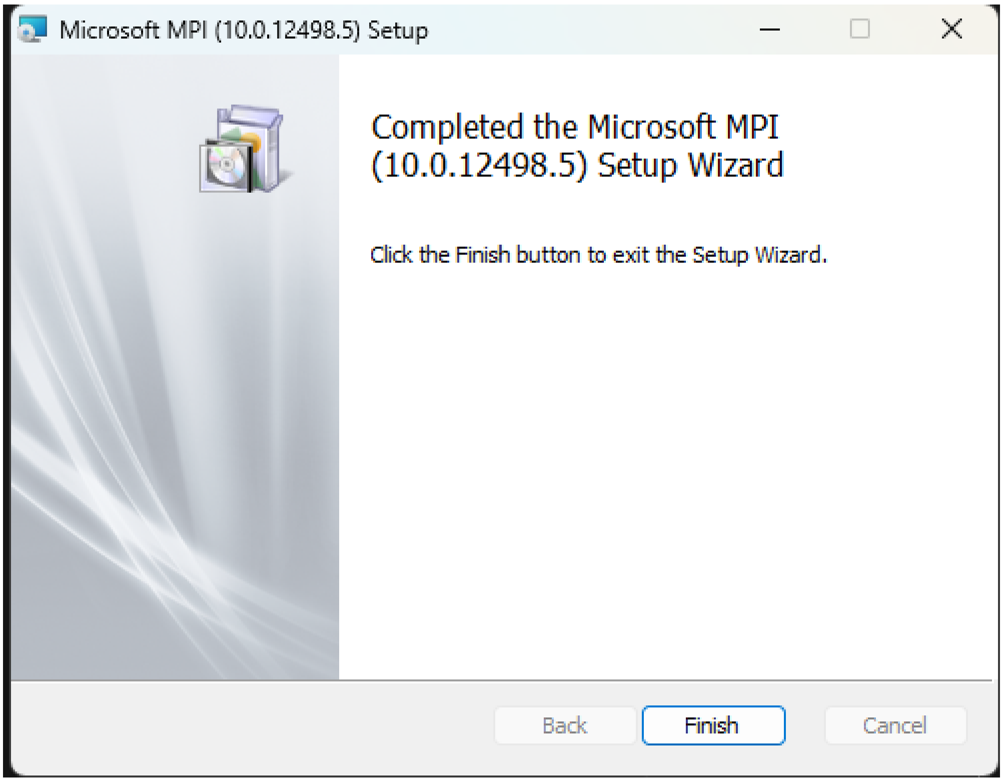
Destination Folder

Click Next to install to the default folder or click Change to choose another.

Install Microsoft MPI (10.0.12498.5) to:

C:\Program Files\Microsoft MPI\

Change...
Back
Next
Cancel

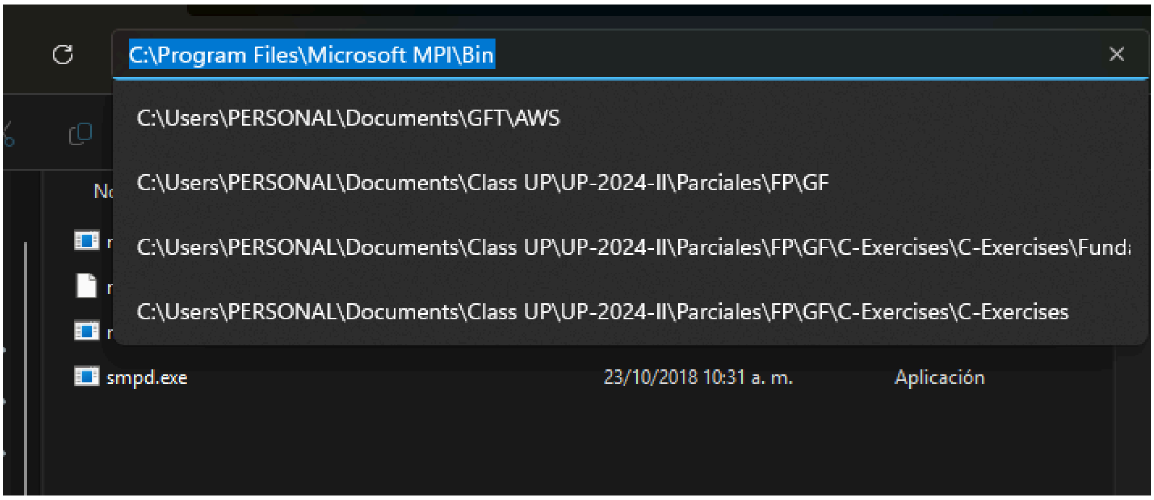


Microsoft MPI (10.0.12498.5) Setup

Completed the Microsoft MPI (10.0.12498.5) Setup Wizard

Click the Finish button to exit the Setup Wizard.

2. Confirmar instalación en la ruta:



C:\Program Files\Microsoft MPI\Bin

C:\Users\PERSONAL\Documents\GFT\AWS

C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF

C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF\C-Exercises\C-Exercises\Fund

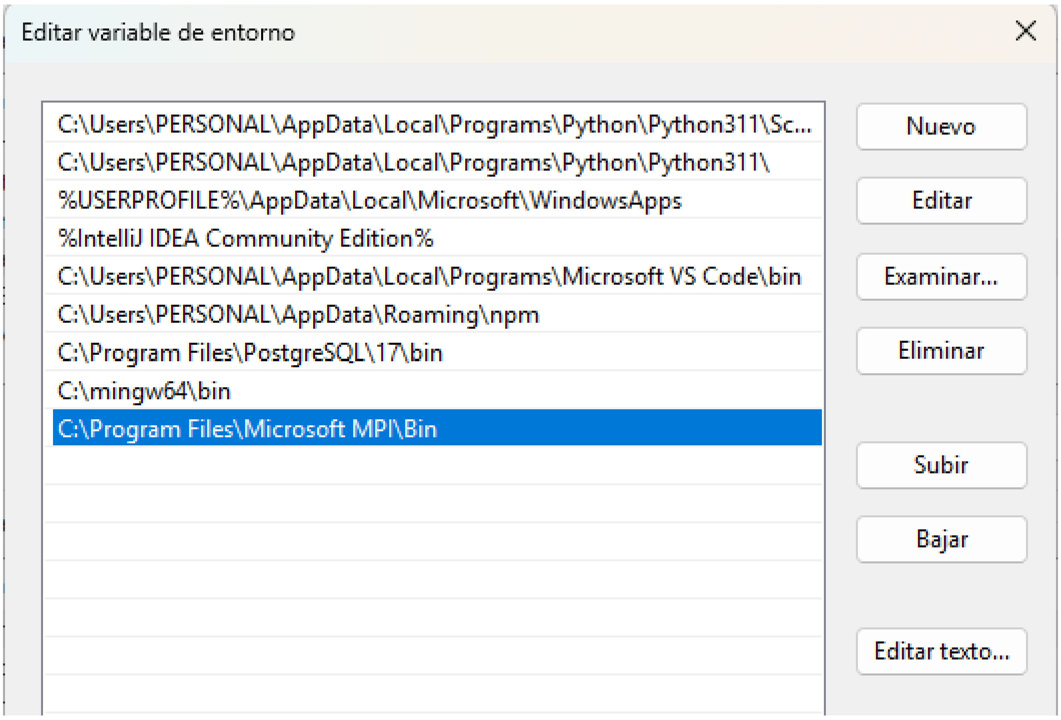
C:\Users\PERSONAL\Documents\Class UP\UP-2024-II\Parciales\FP\GF\C-Exercises\C-Exercises

smpd.exe 23/10/2018 10:31 a. m. Aplicación

```
C:\Program Files\Microsoft SDKs\MPI
```

3. Agregar al **PATH**:

```
C:\Program Files\Microsoft SDKs\MPI\Bin
```

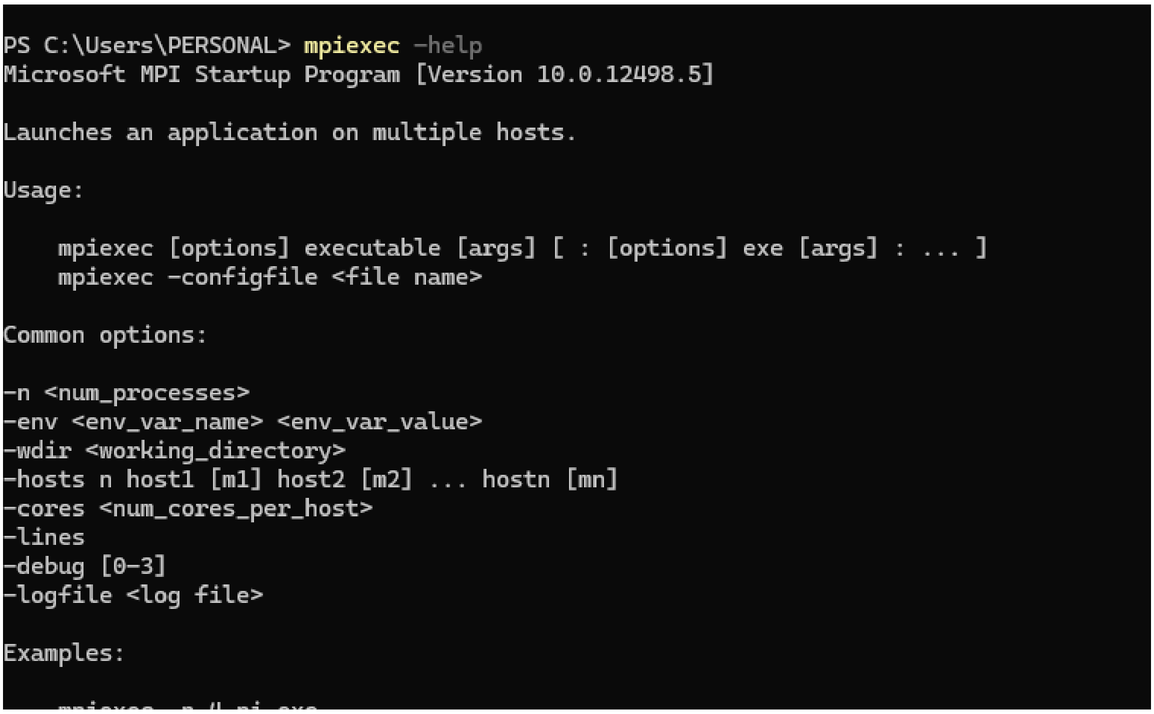


Editar variable de entorno

```
C:\Users\PERSONAL\AppData\Local\Programs\Python\Python311\Sc...
C:\Users\PERSONAL\AppData\Local\Programs\Python\Python311\
%USERPROFILE%\AppData\Local\Microsoft\WindowsApps
%IntelliJ IDEA Community Edition%
C:\Users\PERSONAL\AppData\Local\Programs\Microsoft VS Code\bin
C:\Users\PERSONAL\AppData\Roaming\npm
C:\Program Files\PostgreSQL\17\bin
C:\mingw64\bin
C:\Program Files\Microsoft MPI\Bin
```

4. Verificar instalación:

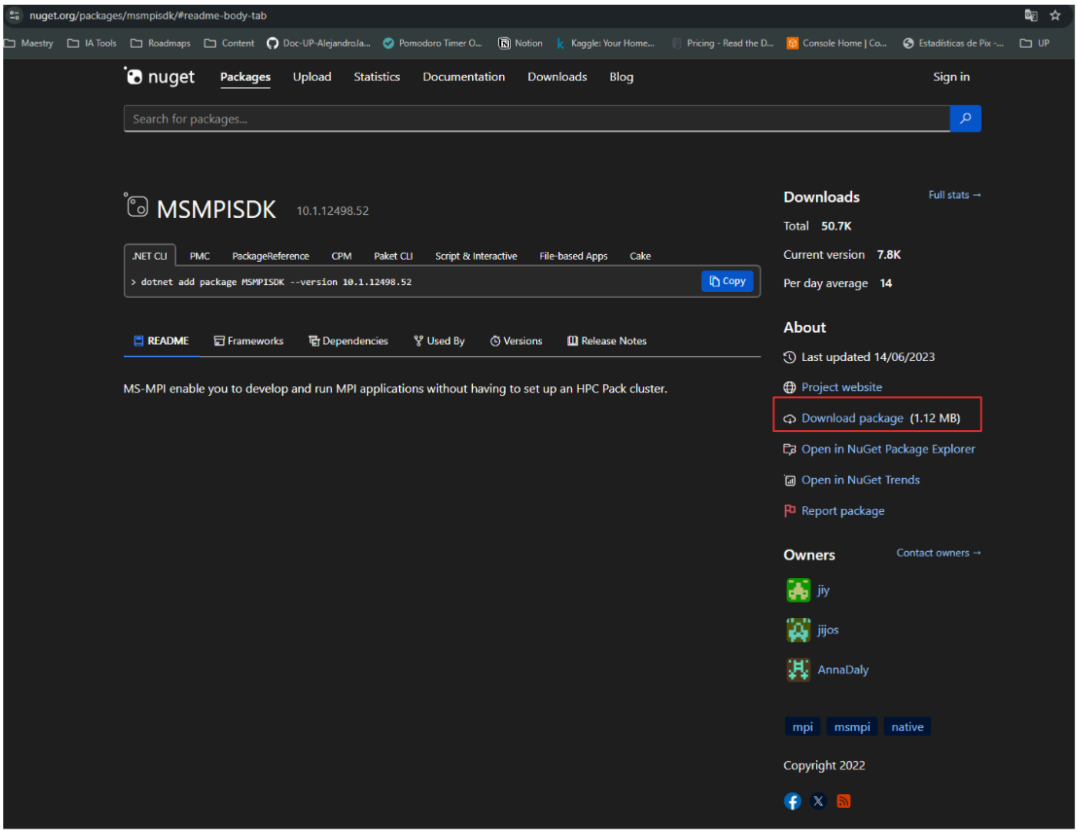
```
mpiexec -help
```



```
PS C:\Users\PERSONAL> mpiexec -help
Microsoft MPI Startup Program [Version 10.0.12498.5]

Launches an application on multiple hosts.

Usage:

    mpiexec [options] executable [args] [ : [options] exe [args] : ... ]
    mpiexec -configfile <file name>

Common options:

-n <num_processes>
-env <env_var_name> <env_var_value>
-wdir <working_directory>
-hosts n host1 [m1] host2 [m2] ... hostn [mn]
-cores <num_cores_per_host>
-lines
-debug [0-3]
-logfile <log file>

Examples:

    mpiexec -n 4 pi.exe
```

5. Descargar el `.nupkg` desde NuGet

- Descargar del siguiente link: https://www.nuget.org/packages/msmpisdk/#readme-body-tab



```
> dotnet add package MSMPISDK --version 10.1.12498.52
```

MS-MPI enable you to develop and run MPI applications without having to set up an HPC Pack cluster.

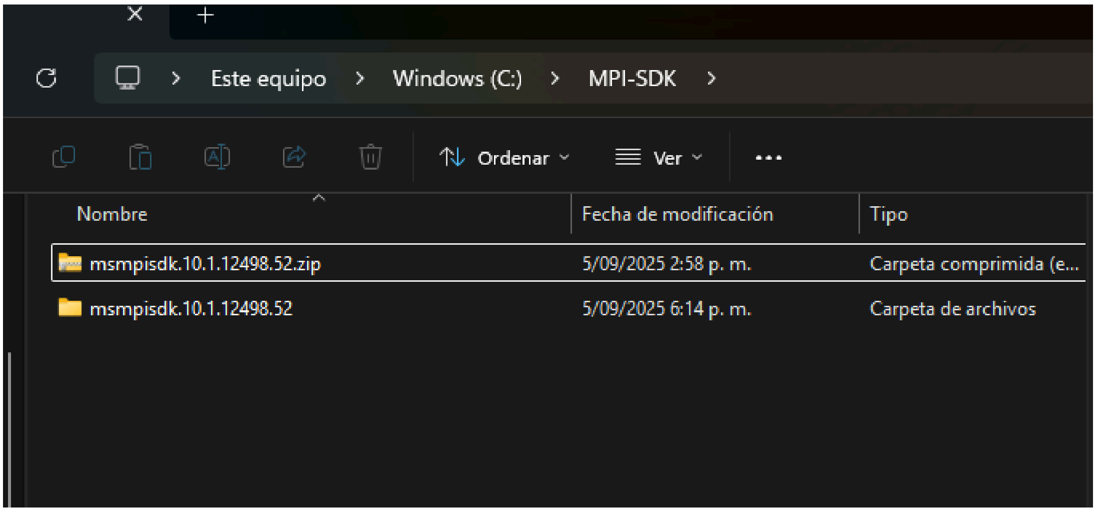
Total 50.7K

Current version 7.8K

Per day average 14

Last updated 14/06/2023

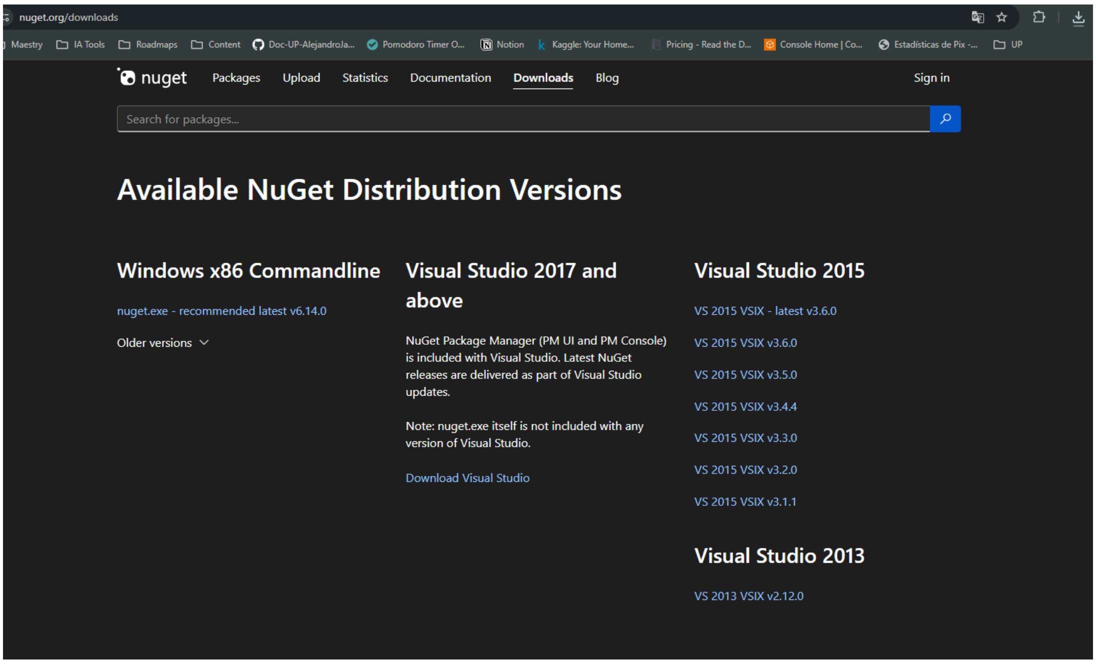
- Renombrar .nupkg a .zip .
  - Extraerlo
  - Copiar las carpetas include y lib a la ruta: ***C:\MPI-SDK***



Nombre	Fecha de modificación	Tipo
msmpisdk.10.1.12498.52.zip	5/09/2025 2:58 p. m.	Carpeta comprimida (e...
msmpisdk.10.1.12498.52	5/09/2025 6:14 p. m.	Carpeta de archivos

6. Descargar e instalar nuget de : https://www.nuget.org/downloads

a. nuget.exe - reccommended latests v6.14.0



Available NuGet Distribution Versions

Windows x86 Commandline

nuget.exe - recommended latest v6.14.0

Older versions

Visual Studio 2017 and above

NuGet Package Manager (PM UI and PM Console) is included with Visual Studio. Latest NuGet releases are delivered as part of Visual Studio updates.

Note: nuget.exe itself is not included with any version of Visual Studio.

Download Visual Studio

Visual Studio 2015

VS 2015 VSIX - latest v3.6.0

VS 2015 VSIX v3.6.0

VS 2015 VSIX v3.5.0

VS 2015 VSIX v3.4.4

VS 2015 VSIX v3.3.0

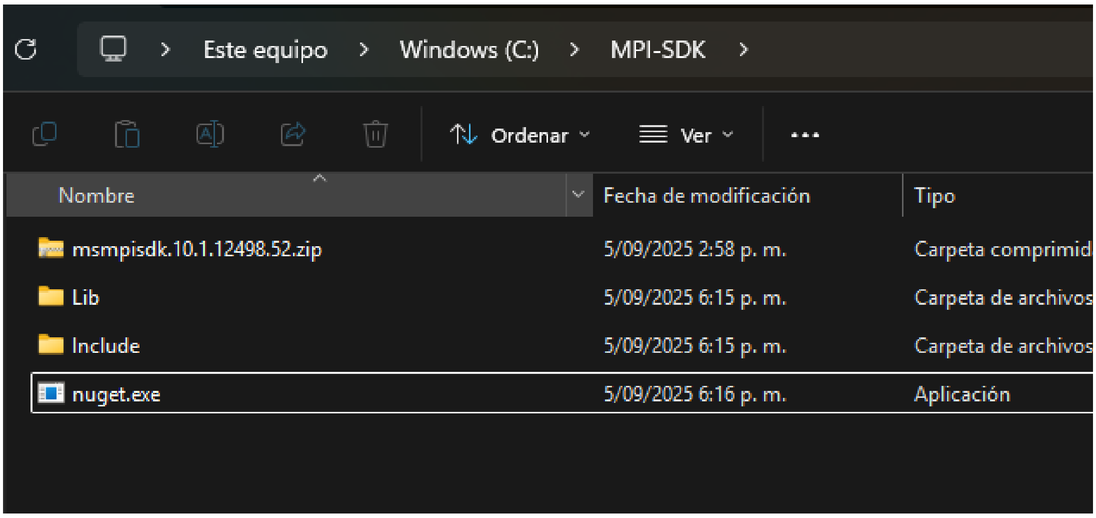
VS 2015 VSIX v3.2.0

VS 2015 VSIX v3.1.1

Visual Studio 2013

VS 2013 VSIX v2.12.0

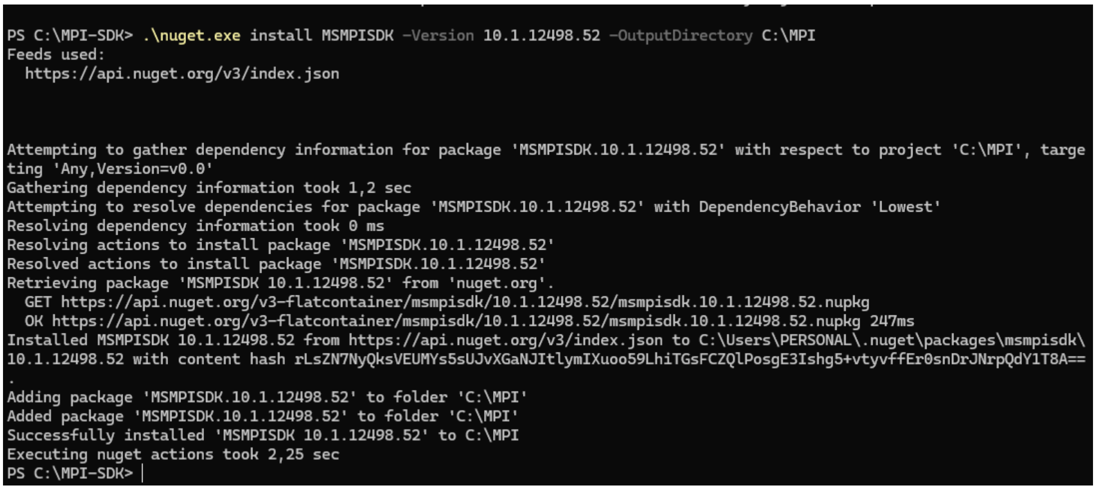
b. mover a la carpeta ***C:\MPI-SDK*** **.**



Nombre	Fecha de modificación	Tipo
msmpisdk.10.1.12498.52.zip	5/09/2025 2:58 p. m.	Carpeta comprimid
Lib	5/09/2025 6:15 p. m.	Carpeta de archivos
Include	5/09/2025 6:15 p. m.	Carpeta de archivos
nuget.exe	5/09/2025 6:16 p. m.	Aplicación

c. Ejecutar el siguiente comando

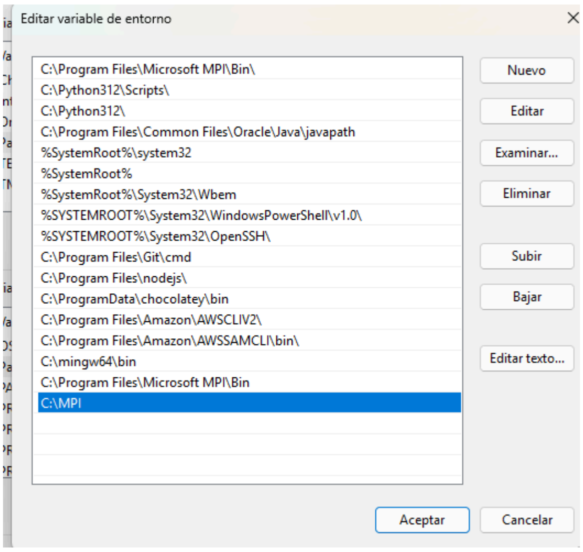
```
.\nuget.exe install MSMPISDK -Version 10.1.12498.52 -OutputDirecto
ry C:\MPI
```



```
PS C:\MPI-SDK> .\nuget.exe install MSMPISDK -Version 10.1.12498.52 -OutputDirectory C:\MPI
Feeds used:
  https://api.nuget.org/v3/index.json


Attempting to gather dependency information for package 'MSMPISDK.10.1.12498.52' with respect to project 'C:\MPI', targe
ting 'Any,Version=v0.0'
Gathering dependency information took 1,2 sec
Attempting to resolve dependencies for package 'MSMPISDK.10.1.12498.52' with DependencyBehavior 'Lowest'
Resolving dependency information took 0 ms
Resolving actions to install package 'MSMPISDK.10.1.12498.52'
Resolved actions to install package 'MSMPISDK.10.1.12498.52'
Retrieving package 'MSMPISDK 10.1.12498.52' from 'nuget.org'.
  GET https://api.nuget.org/v3-flatcontainer/msmpisdk/10.1.12498.52/msmpisdk.10.1.12498.52.nupkg
  OK https://api.nuget.org/v3-flatcontainer/msmpisdk/10.1.12498.52/msmpisdk.10.1.12498.52.nupkg 247ms
Installed MSMPISDK 10.1.12498.52 from https://api.nuget.org/v3/index.json to C:\Users\PERSONAL\.nuget\packages\msmpisdk\
10.1.12498.52 with content hash rLsZN7NyQksVEUMYs5sUJvXGaNJItlymIXuoo59LhiTGsFCZQlPosgE3Ishg5+vtyvffEr0snDrJNrpQdY1T8A==
.
Adding package 'MSMPISDK.10.1.12498.52' to folder 'C:\MPI'
Added package 'MSMPISDK.10.1.12498.52' to folder 'C:\MPI'
Successfully installed 'MSMPISDK 10.1.12498.52' to C:\MPI
Executing nuget actions took 2,25 sec
PS C:\MPI-SDK> |
```

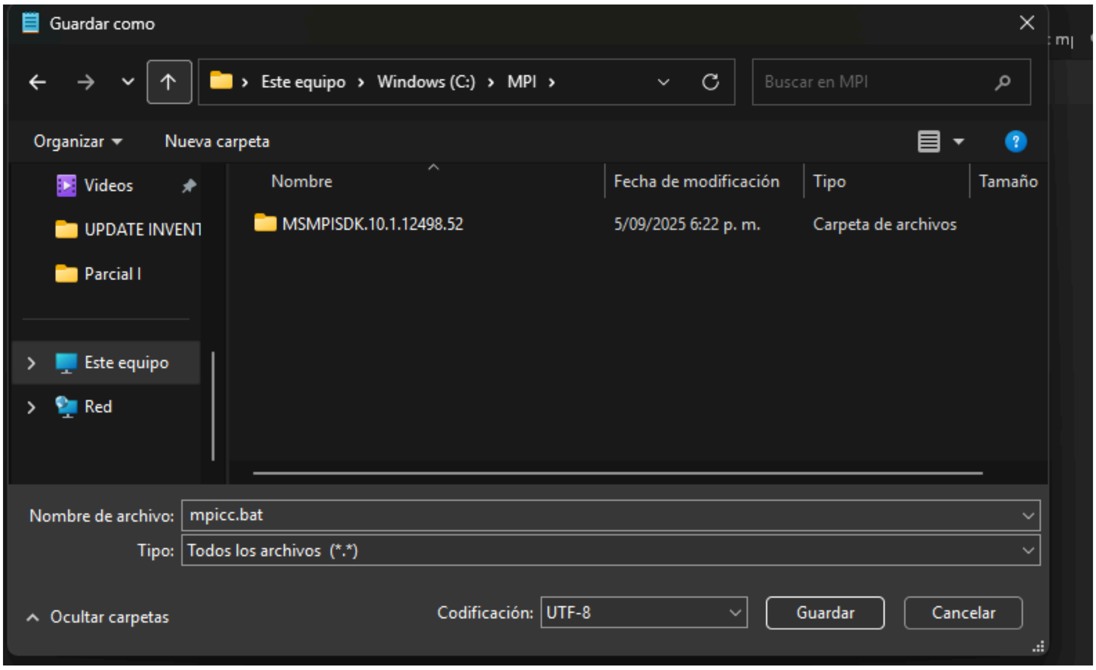
d. Crear un archivo `.bat` y guardarlo en la ruta: `C:\MPI\mpicc.bat`

    i. Agregar al PATH de Windows, la ruta ***C:\MPI***



```
C:\Program Files\Microsoft MPI\Bin\
C:\Python312\Scripts\
C:\Python312\
C:\Program Files\Common Files\Oracle\Java\javapath
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
%SYSTEMROOT%\System32\WindowsPowerShell\v1.0\
%SYSTEMROOT%\System32\OpenSSH\
C:\Program Files\Git\cmd
C:\Program Files\nodejs\
C:\ProgramData\chocolatey\bin
C:\Program Files\Amazon\AWSCLIV2\
C:\Program Files\Amazon\AWSSAMCLI\bin\
C:\mingw64\bin
C:\Program Files\Microsoft MPI\Bin
C:\MPI
```

```
@echo off
setlocal
set INCLUDE_DIR="C:\MPI-SDK\Include"
set LIB_DIR="C:\MPI-SDK\Lib\x64"

gcc %* -I%INCLUDE_DIR% -L%LIB_DIR% -lmsmpi
endlocal
```

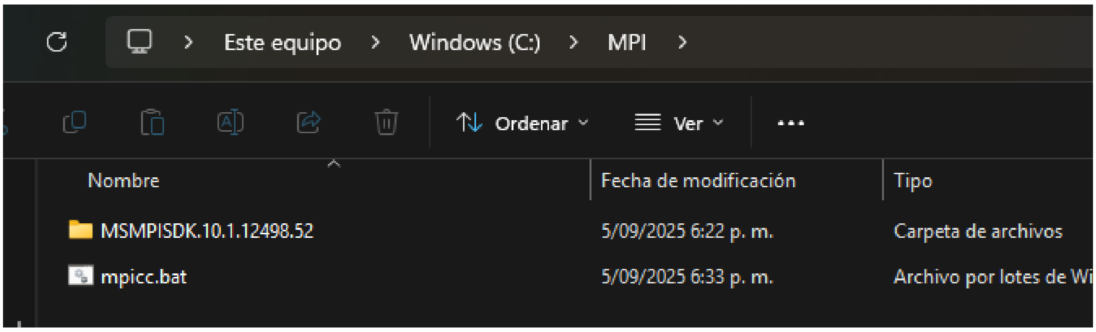


Nombre	Fecha de modificación	Tipo	Tamaño
MSMPISDK.10.1.12498.52	5/09/2025 6:22 p. m.	Carpeta de archivos	

Nombre de archivo: mpicc.bat

Tipo: Todos los archivos (*.*)

Codificación: UTF-8



Nombre	Fecha de modificación	Tipo
MSMPISDK.10.1.12498.52	5/09/2025 6:22 p. m.	Carpeta de archivos
mpicc.bat	5/09/2025 6:33 p. m.	Archivo por lotes de Wi

5. Compilar y ejecutar programas con MPI

1. Crear un archivo de prueba (`mpi_00_test.c.c`):

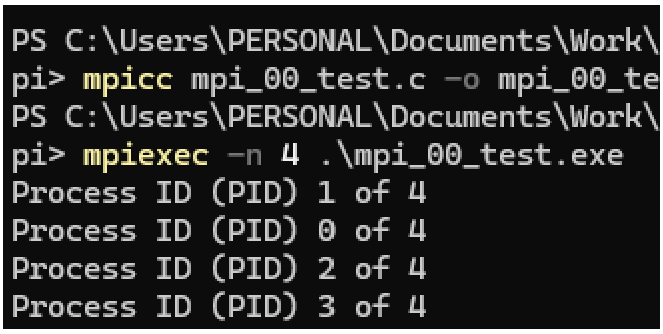
```
#include <mpi.h>
#include <stdio.h>

int main(int argc, char** argv) {

    MPI_Init(&argc, &argv);
    int world_rank, world_size;

    MPI_Comm_rank(MPI_COMM_WORLD, &world_rank);
    MPI_Comm_size(MPI_COMM_WORLD, &world_size);
    printf("Process ID (PID) %d of %d\n", world_rank, world_size);
    MPI_Finalize();
    return 0;
}
```

2. Compilar con `mpicc`:

```
mpicc mpi_00_test.c -o mpi_00_test.exe
```

3. Ejecutar con varios procesos:

```
mpiexec -n 4 .\mpi_00_test.exe
```



```
PS C:\Users\PERSONAL\Documents\Work\
pi> mpicc mpi_00_test.c -o mpi_00_te
PS C:\Users\PERSONAL\Documents\Work\
pi> mpiexec -n 4 .\mpi_00_test.exe
Process ID (PID) 1 of 4
Process ID (PID) 0 of 4
Process ID (PID) 2 of 4
Process ID (PID) 3 of 4
```