



Linux Environment Setup

2024 Fall, Introduction to Data Communication Networks

Minjae Lee, Wonjun Bang

Networked Computing Lab (NXC Lab)

nxclab@gmail.com

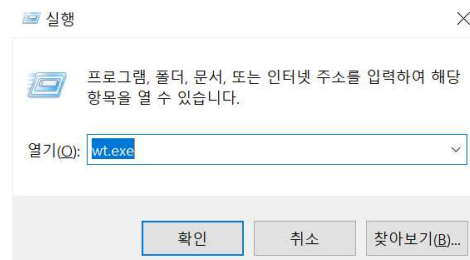
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Windows - WSL2

- Windows Subsystem for Linux
- Warning!
 - Your OS should be Windows 11 or Windows 10 with Version 20H1 or higher.
 - You can not use VirtualBox and WSL2 at the same time.
- Run Windows Terminal as administrator
 - Open “wt.exe” with [Window + R]



Windows 사양

에디션	Windows 10 Pro
버전	21H2
설치 날짜	2021-08-02
OS 빌드	19044.1889
경험	Windows Feature Experience Pack 120.2212.4180.0

복사

[제품 키 변경 또는 Windows 버전 업그레이드](#)

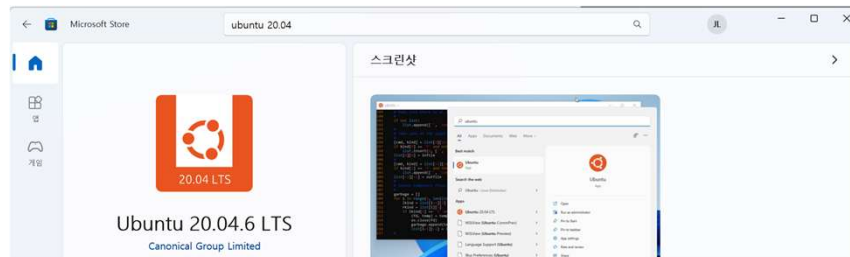
[서비스에 적용되는 Microsoft 서비스 계약 읽기](#)

[Microsoft 소프트웨어 사용 조건 읽기](#)

- Enter the following commands (check if it succeeds)
 - \$ dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart
 - \$ dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
 - And Reboot!

Windows - WSL2

- Install WSL2
 - `$ wsl --install`
 - Download Ubuntu 20.04.6 LTS via Microsoft Store
 - or `wsl --install -d Ubuntu-20.04`
 - Execute the application (It will help you finish installing)
 - Set Username / Password

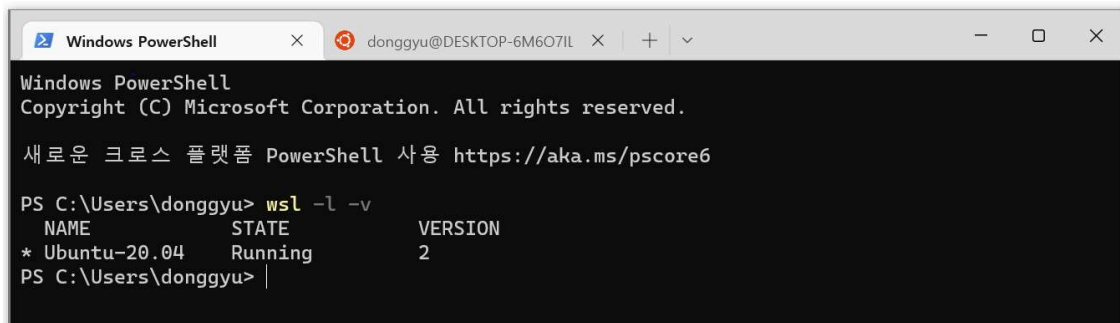


```
jerryjelly@MinjaeDell: ~
Installing, this may take a few minutes...
Please create a default UNIX user account. The username does not need to match your Windows username.
For more information visit: https://aka.ms/wslusers
Enter new UNIX username: jerryjelly
New password:
Retype new password:
passwd: password updated successfully
Installation successful!
이제 Linux용 Windows 하위 시스템을 Microsoft Store에서 사용할 수 있습니다.
'wsl.exe --update'를 실행하거나 https://aka.ms/wslstorepage를 방문하여 업그레이드할 수 있습니다.
Microsoft Store의 WSL을 설치하면 최신 WSL 업데이트가 더 빠르게 제공됩니다.
자세한 내용은 https://aka.ms/wslstoreinfo를 방문하세요.
```

- Download & Execute the WSL update package for x64 machine
 - https://wslstorestorage.blob.core.windows.net/wslblob/wsl_update_x64.msi
- Open the terminal and set the version to WSL2
 - For version check : `$ wsl -l -v`
 - If the version shows "1" : `$ wsl --set-version Ubuntu-20.04 2`

Windows - WSL2

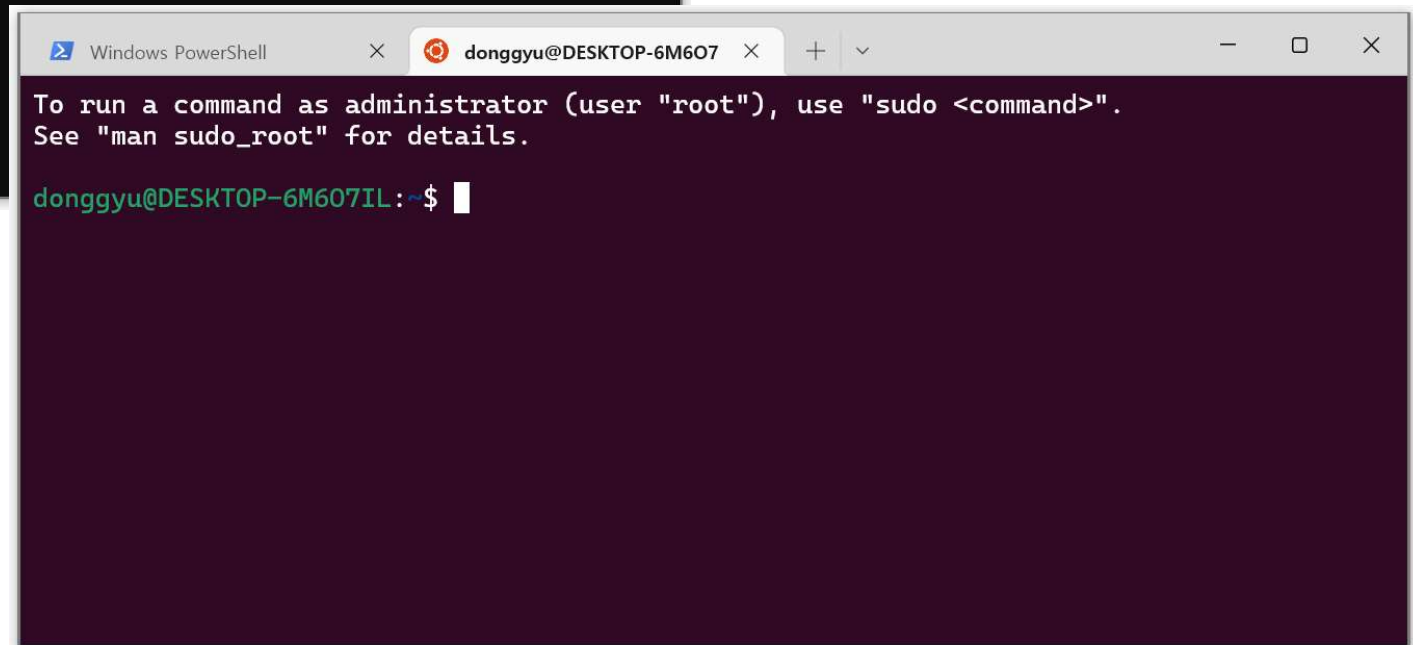
- Now you can enjoy Ubuntu on Windows!



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

새로운 크로스 플랫폼 PowerShell 사용 https://aka.ms/pscore6

PS C:\Users\donggyu> wsl -l -v
   NAME                STATE              VERSION
* Ubuntu-20.04         Running            2
PS C:\Users\donggyu> |
```



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

donggyu@DESKTOP-6M607IL:~$
```

Windows - GCC Compiler Settings

- \$sudo apt update && sudo apt -y upgrade
- \$sudo apt install gcc gdb make
- \$ gcc --version

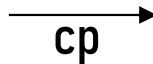
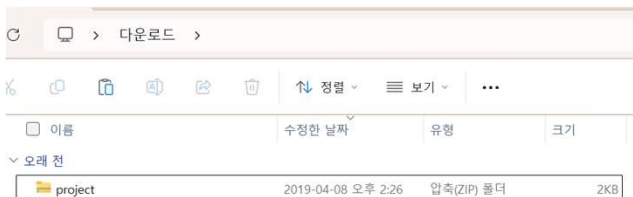
```
(base) jerryjelly@MinjaeDell:~$ gdb --version
GNU gdb (Ubuntu 10.2-0ubuntu1~20.04~1) 10.2
Copyright (C) 2021 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
(base) jerryjelly@MinjaeDell:~$ gcc --version
gcc (Ubuntu 9.4.0-1ubuntu1~20.04.2) 9.4.0
Copyright (C) 2019 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.

(base) jerryjelly@MinjaeDell:~$ make --version
GNU Make 4.2.1
Built for x86_64-pc-linux-gnu
Copyright (C) 1988-2016 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.
```



Windows – Moving Files

- If files are located at “Downloads” folder,
 - `$cp /mnt/c/Users/<username>/Downloads/<filename> ./` // copying
 - `$mv /mnt/c/Users/<username>/Downloads/<filename> ./` // moving
 - `$ls` // check if the files are successfully moved into current directory.



```
jerryjelly@MinjaeDell: ~/proje x + v
(base) jerryjelly@MinjaeDell:~/project$ cp /mnt/c/Users/skaal/Downloads/project.zip ./
(base) jerryjelly@MinjaeDell:~/project$ ls
project.zip
(base) jerryjelly@MinjaeDell:~/project$ |
```

Mac - Homebrew

- Package Management System for Mac (<https://brew.sh/>)
- Install Homebrew (requires `sudo` access):



- `$ /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"`

```
choehuijeong@choehuijeong-ui-MacBookPro ~ % /bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"

==> Checking for `sudo` access (which may request your password)...
Password:
==> This script will install:
/opt/homebrew/bin/brew
/opt/homebrew/share/doc/homebrew
/opt/homebrew/share/man/man1/brew.1
/opt/homebrew/share/zsh/site-functions/_brew
/opt/homebrew/etc/bash_completion.d/brew
/opt/homebrew
```

- `$ echo 'eval "$(/opt/homebrew/bin/brew shellenv)"' >> ~/.zprofile`
 - The path may vary depending on your Mac environment.
 - So, please refer to the *'Next steps:'* instruction.

```
==> Next steps:
- Run these two commands in your terminal to add Homebrew to your PATH:
  (echo; echo 'eval "$(/usr/local/bin/brew shellenv)"') >> /Users/b/.zprofile
  eval "$(/usr/local/bin/brew shellenv)"
- Run brew help to get started
- Further documentation:
  https://docs.brew.sh
```

- `$ brew --version`

- If you can check your brew version like `>> Homebrew 4.1.9`, you installed Homebrew successfully.

```
choehuijeong@choehuijeong-ui-MacBookPro ~ % echo 'eval "$(/opt/homebrew/bin/brew shellenv)"' >> ~/.zprofile
file
choehuijeong@choehuijeong-ui-MacBookPro ~ % brew --version
Homebrew 4.1.10
```


Mac - GCC Compiler Settings

- Open Terminal
- Installing CommandLineTools (with online connection)
 - `$xcode-select --install`
- Install gcc compiler with brew (<https://brew.sh/>)
 - `$brew install gcc make`

```
b@bs-MacBook-Pro DS % brew install gcc@11
Running `brew update --auto-update`...
Installing from the API is now the default behaviour!
You can save space and time by running:
  brew untap homebrew/core
```

- `$gcc --version` [//version check](#)

```
b@bs-MacBook-Pro DS % alias g++='g++-11 std=c++17'
b@bs-MacBook-Pro DS % g++ --version
g++-11 (Homebrew GCC 11.4.0) 11.4.0
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.
```



Let's Write C Code and Compile!

- Create a C source file with Vim editor.
 - `$ vim <file name>`
 - If you have not installed Vim, you should install it first.
 - File name should be ended with '.c'.
 - Press `<ESC>` button, and then enter `<i>`.
 - It allows you to enter INSERT mode.
- Write the code, press `<ESC>` button, and enter `<wq>`.
 - It allows you to write the file and quit edit mode.

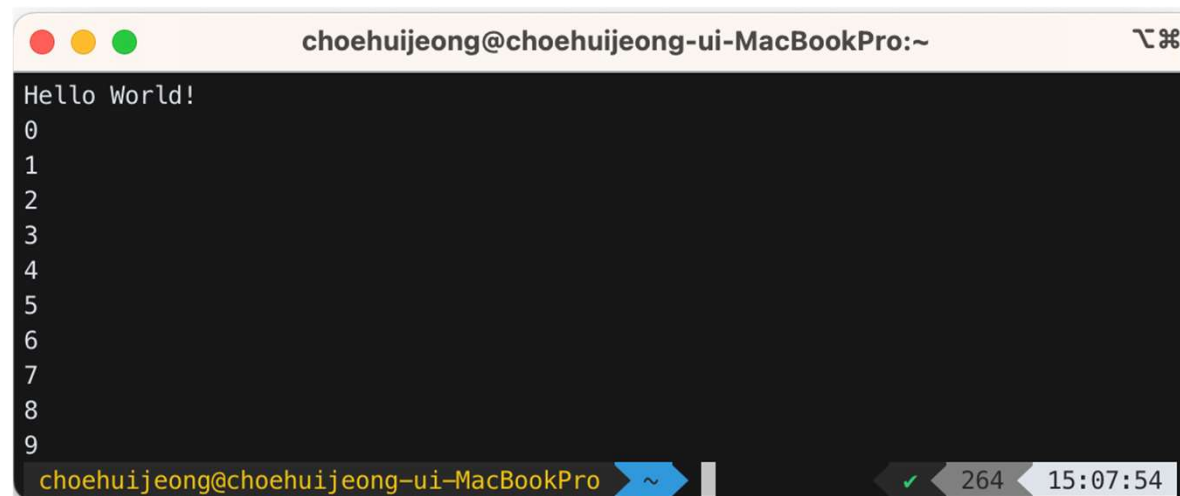
```
#include <iostream>

int main(){
    std::cout << "Hello World!" << std::endl;
    for (int i=0; i<10; i++){
        std::cout << i << std::endl;
    }
    return 0;
}
```



Let's Write C Code and Compile!

- Compile your code
 - `$gcc <file name> -o <output name>`
 - Output file should be ended with '.out'.
 - i.e. `$gcc main.cpp -o main.out`
- Check if the output is correct.
 - `$/main.out`
 - You cannot omit './', i.e., '\$ main.out' may show an error message.

A screenshot of a macOS terminal window. The title bar shows the user 'choehuijeong' on a 'MacBookPro' machine. The terminal displays the output 'Hello World!' on the first line. Below it, lines 0 through 9 are visible, indicating the cursor has moved down. The status bar at the bottom shows the user 'choehuijeong@choehuijeong-ui-MacBookPro', a blue arrow icon, a green checkmark, the number '264', and the time '15:07:54'.

Linux Guide (for Beginners)

- Linux environment
 - Bash shell
 - Default user interface in Linux
 - Basic bash commands
 - More detail about bash commands can be found in Google

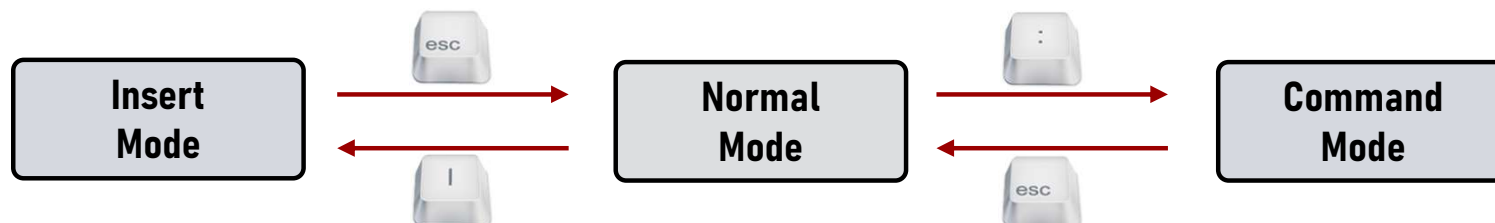
Command	Description
ls	list directory contents
mkdir [<i>directory_name</i>]	create a directory
pwd	print absolute path of current location
cd [<i>destination_directory</i>]	move to the directory
mv [<i>source</i>] [<i>destination</i>]	move source file to destination or rename the source
cp [<i>source</i>] [<i>destination</i>]	copy source file to destination
rm [<i>file_name</i>]	remove the file



Vim – Text Editor

- Vim (text editor)
 - To create and edit the file (e.g., “vi [*file_name*]”), need a text editor program
 - Vim is compatible with vi (basic text editor) which is mode-based editor with many useful functions.
- Start the Vim
 - To install vim, type “\$ sudo apt update” and “\$ sudo apt install vim”

Command	Description
i	move to insert mode (insert text before the cursor)
:w	write and save the current file
:q!	quit vim without saving changes
:wq	save the current file and quit vim



Vim – Text Editor

- Customize the Vim (optional)
 - By editing “~/.vimrc” file, you can customize your vim.
 - Settings
 - Syntax highlight (colored syntax)
 - Automatic indentation
 - Line number
 - Tap space

jellybeans.vim

A colorful, dark color scheme, inspired by [ir_black](#) and [twilight](#).

Designed primarily for a graphical Vim, but includes support for 256, 88, 16, and 8 color terminals. On a 16 or 8 color terminal, replace its colors with those in `ansi-term-colors.txt` for best results.

This script is [vimscript #2555](#) at Vim.org.

Jellybeans has also been ported to other editors and programs, listed on the [Ports wiki page](#).

Scroll down for [screenshots](#)!

Installation

Install the color scheme by adding it to your `~/.vim/colors` directory

```
mkdir -p ~/.vim/colors
cd ~/.vim/colors
curl -O https://raw.githubusercontent.com/nanotech/jellybeans.vim/master/colors/jellybeans.vim
```

VS Code

- You can utilize Visual Studio Code.
 - <https://code.visualstudio.com/download>
 - It is a language-agnostic code editor for any language.
- It can support both of Mac and Windows.
 - For Mac users, you should set for C compiling at VS Code.
 - For Windows users, you should install `WSL` extensions and then set for C compiling at VS Code.
- For more information, Google with keywords like 'vscode mac c', 'vscode c wsl2'.

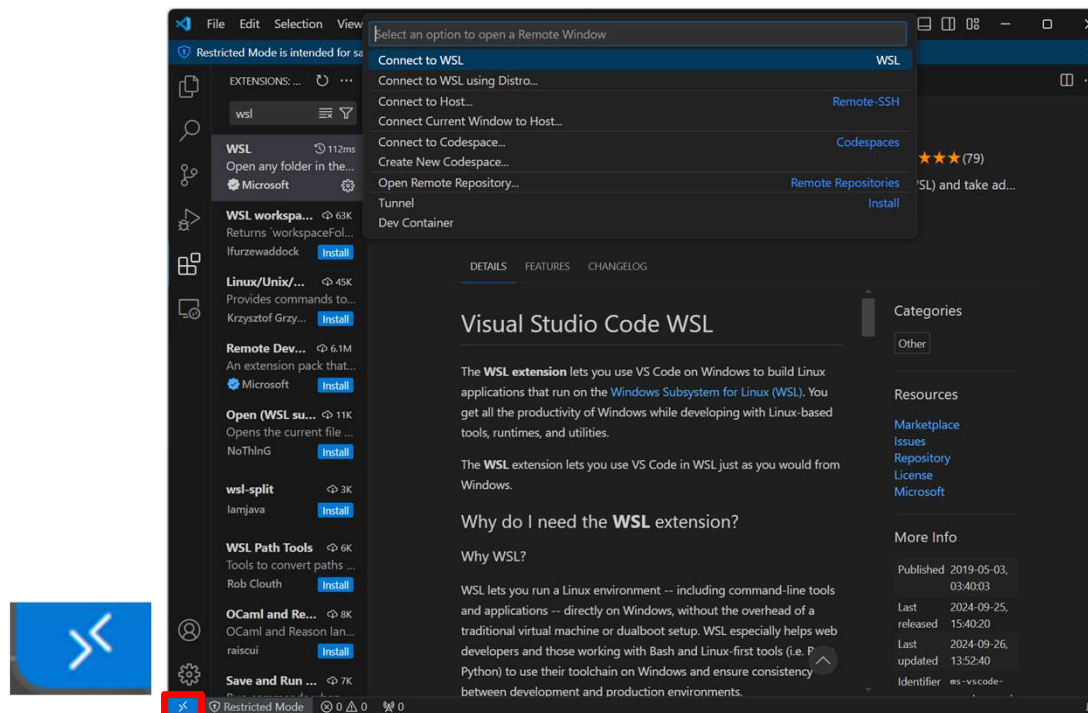
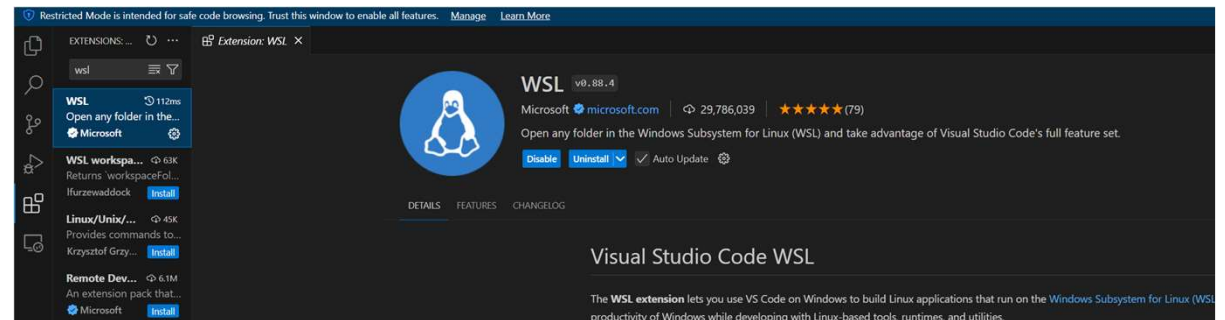


```
main.cpp - data-structures [WSL: Ubuntu-20.04] - Visual Studio Code

main.cpp x main {} launch.json {} tasks.json
main.cpp > main()
3 int main() {
4     std::cout << "Hello World!" << std::endl;
5     for (int i=0; i<10; i++) {
6         std::cout << i << std::endl;
7     }
8     return 0;
9 }
```

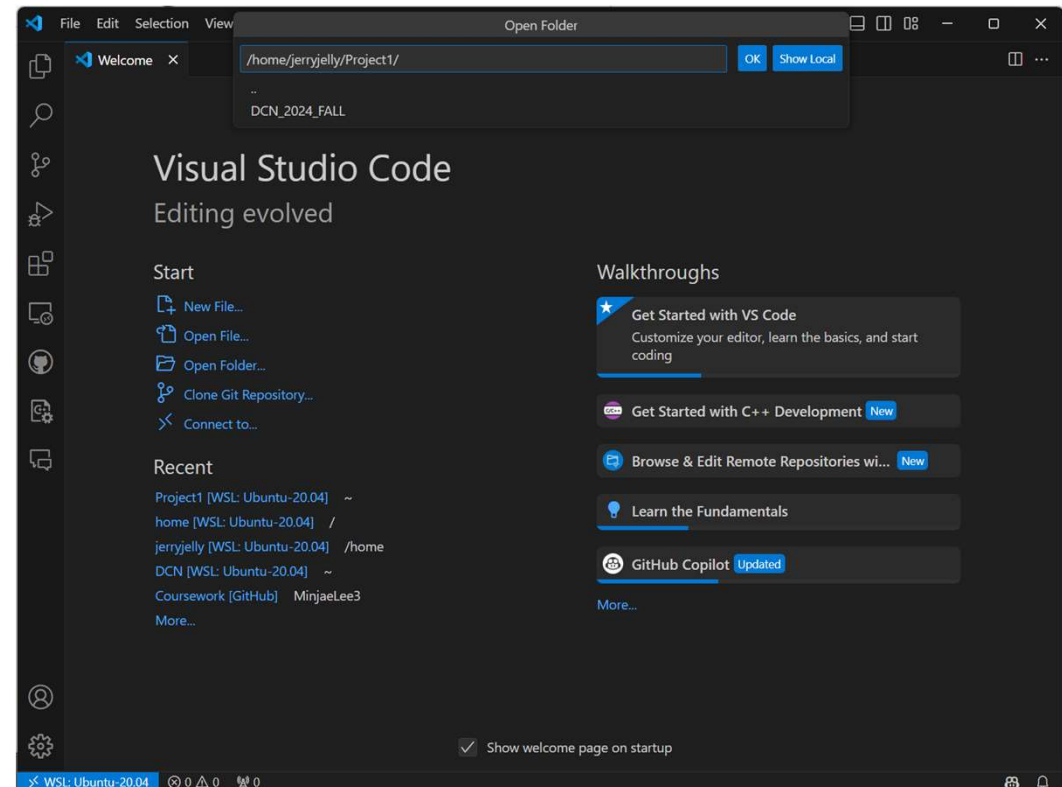
VS Code - WSL

- Extension – WSL
- Open a remote window
– Connect to WSL



Testing the Environment

- Copy the project0 file into the workspace (wsl).
 - `$cp /mnt/c/Users/<username>/Downloads/project0.zip ./`
- Unzip the file
 - `$sudo apt install zip unzip // if not installed`
 - `$unzip project0.zip`
- Open Folder in VS Code



Testing the Environment

- Terminal – New Terminal (Ctrl+Shift+`)
- \$make
- \$./server 5000 // opening server with port 5000





Web Server Programming

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Minjae Lee, Wonjun Bang

Networked Computing Lab (NXC Lab)

nxclab@gmail.com

Schedule for Project

- Project 1: Web Server Programming (10/8 ~)
- Project 2: WebRTC



Project 1: Web Server Programming

- Implement a web server by socket programming in C.
 - Which can handle **http request** and **respond properly**



Web Server Image



Thank you

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