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C++ Jump Start

Data Structures
C++ for C Coders

한동대학교 김영섭교수
idebtor@gmail.com

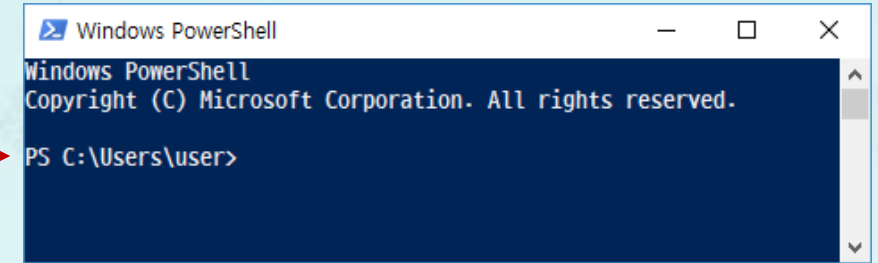
Start a console
PS, cmd, bash
Revisiting installation of g++
atom, git, github, github Desktop
C vs C++
In-house programming principles
Hello World

C++ for C Coders

- Don't forget registering Piazza.com
- Reading material available in github.com/idebtor/nowic
 - **README**
 - **ECE20010 Syllabus**
 - **GettingStarted**

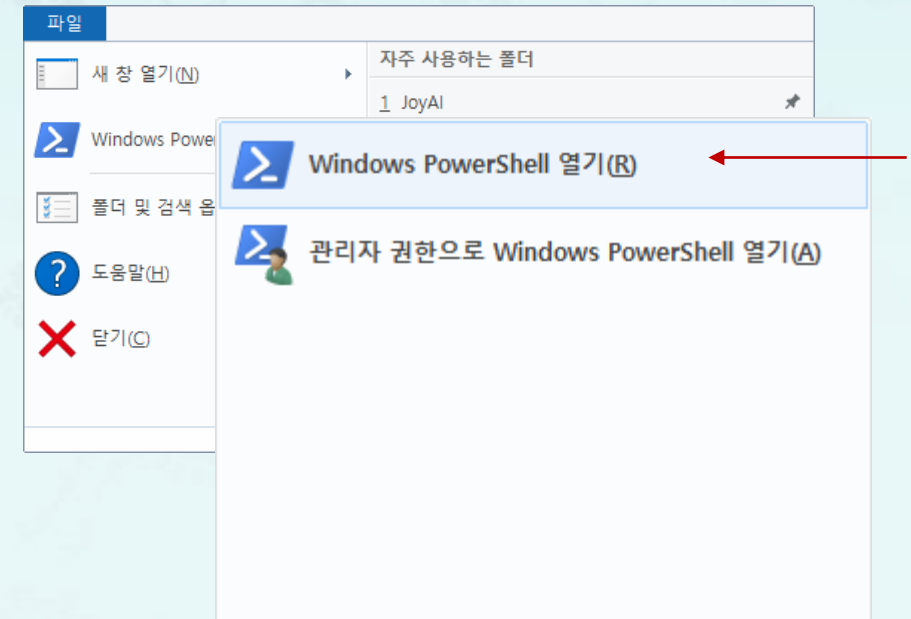
Start a console

1. Start PowerShell through "Start" menu



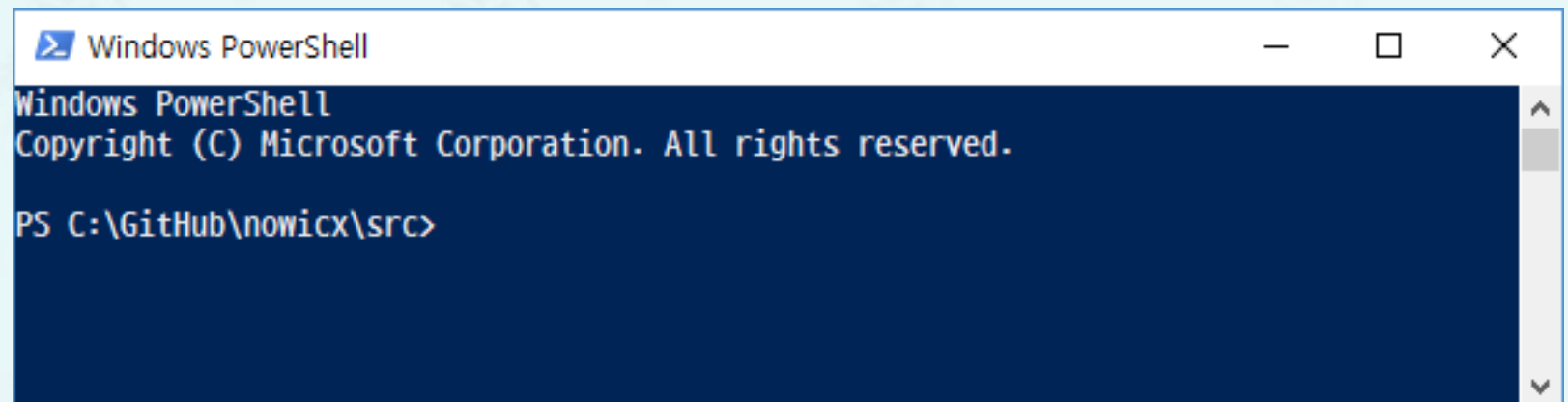
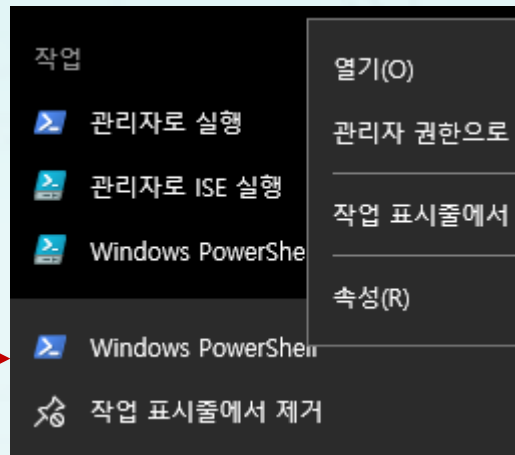
2. Move to the folder you want to start.

- Click the "File" menu at the top left corner of PowerShell or cmd windows
- Enter a command at console. For example, **atom myfile.txt**



Start a console at your favorite folder



1. Start PowerShell if you don't have a PowerShell icon in Taskbar.
2. In the Taskbar right-click and pin to keep a link there.
3. **Again** right click the icon in taskbar and then right-click Windows PowerShell and choose Properties
4. Enter your preferred directory in the Start in: input field and press OK.
5. Start from the taskbar icon



PowerShell, Cmd, vs Bash (Borne-again shell), sh, ksh, csh

PowerShell (Cmdlet)	PowerShell (Alias)	Windows Cmd	Unix shell	Description
Get-ChildItem	gci, dir, ls	dir	ls	Lists all files and folders in the current or given folder
Get-Content	gc, type, cat	type	cat	Gets the content of a file
Get-Command	gcm	help	type, which	Lists available commands
Get-Help	help, man	help	man	Prints a command's documentation on the console
Clear-Host	cls, clear	cls	clear	Clears the screen
Copy-Item	cpi, copy, cp	copy, xcopy	cp	Copies files and folders to another location
Move-Item	mi, move, mv	move	mv	Moves files and folders to a new location
Remove-Item	ri, del, rmdir , rd, rm	del, rmdir, rd	rm, rmdir	Deletes files or folders
Rename-Item	rni, ren, mv	ren, rename	mv	Renames a single file, folder, hard link or symbolic link
Get-Location	gl, cd, pwd	cd	pwd	Displays the working path (current folder)
Pop-Location	popd	popd	popd	Changes the working path to the location most recently pushed onto the stack
Push-Location	pushd	pushd	pushd	Stores the working path onto the stack
Set-Location	sl, cd , chdir	cd, chdir	cd	Changes the working path, cd .. (move to parent folder), cd ~ (move to HOME folder)
Write-Output	echo , write	echo	echo	Prints strings or other objects to the standard output
Get-Process	gps, ps	tlist, tasklist	ps	Lists all running processes
Stop-Process	spps, kill	kill, taskkill	kill	Stops a running process
Select-String	sls	findstr	find, grep	Prints lines matching a pattern
Set-Variable	sv, set	set	env, export, set, setenv	Creates or alters the contents of an environment variable

Install GNU C/C++ Compiler (**MinGW-w64, MSYS2**)

- MSYS = "Minimal SYStem", is a Bourne Shell command line interpreter system
MinGW = "Minimalist GNU for Windows"
- Install MSYS2
<http://www.msys2.org/>
- Install **MinGW-w64**
<https://sourceforge.net/projects/mingw-w64/>
- Add the following path to the PATH environment variable
 - C:/msys64/user/bin
 check your home folder
- Add .bash_profile
 - C:/msys64/home/user/.bash_profile
 check your home folder

.bash_profile (an example) in C:\msys64\home\user

```
alias ls='ls -Gp --color=auto'
alias ll='ls -alkF'
alias rm='rm -i'
alias h='history'
LS_COLORS=$LS_COLORS':no=00:di=36;01'
LS_COLORS=$LS_COLORS':*.h=1;33:*.exe=31:*.o=1;32:*.md=1;33'
export LS_COLORS
export PATH=$PATH:"C:\Program Files\mingw-w64\x86_64-8.1.0-posix-seh-rt_v6-rev0\mingw64\bin"
```

replace 'user' with your own user name in the following line:

```
export PATH=$PATH:"C:\Users\user\AppData\Local\atom\bin" ← This is the folder Atom is installed.
```

```
echo $PWD
```

check your home folder

Setting my dev folder as a startup folder of msys.

```
HOME="/c/GitHub/nowic"
```

```
cd $HOME
```

```
echo $PWD
```

check your github folder

@\$(hostname) may be added, if necessary, after \$(whoami)

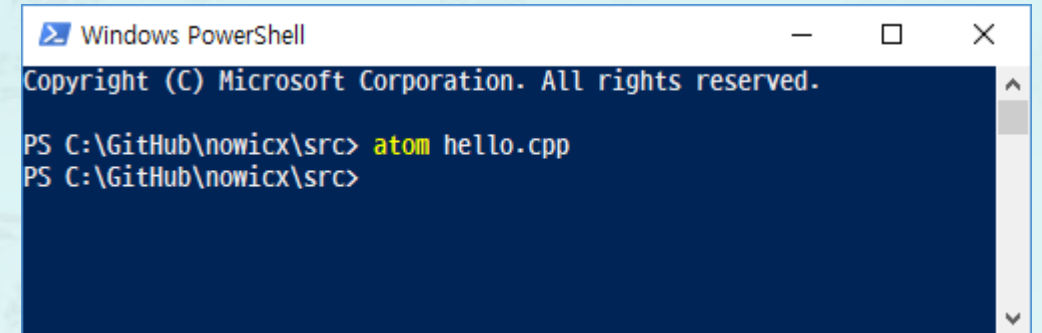
```
GREEN="$(tput setaf 2)"
```

```
RESET="$(tput sgr0)"
```

```
PS1='${GREEN}$(pwd -W)> ${RESET}'
```

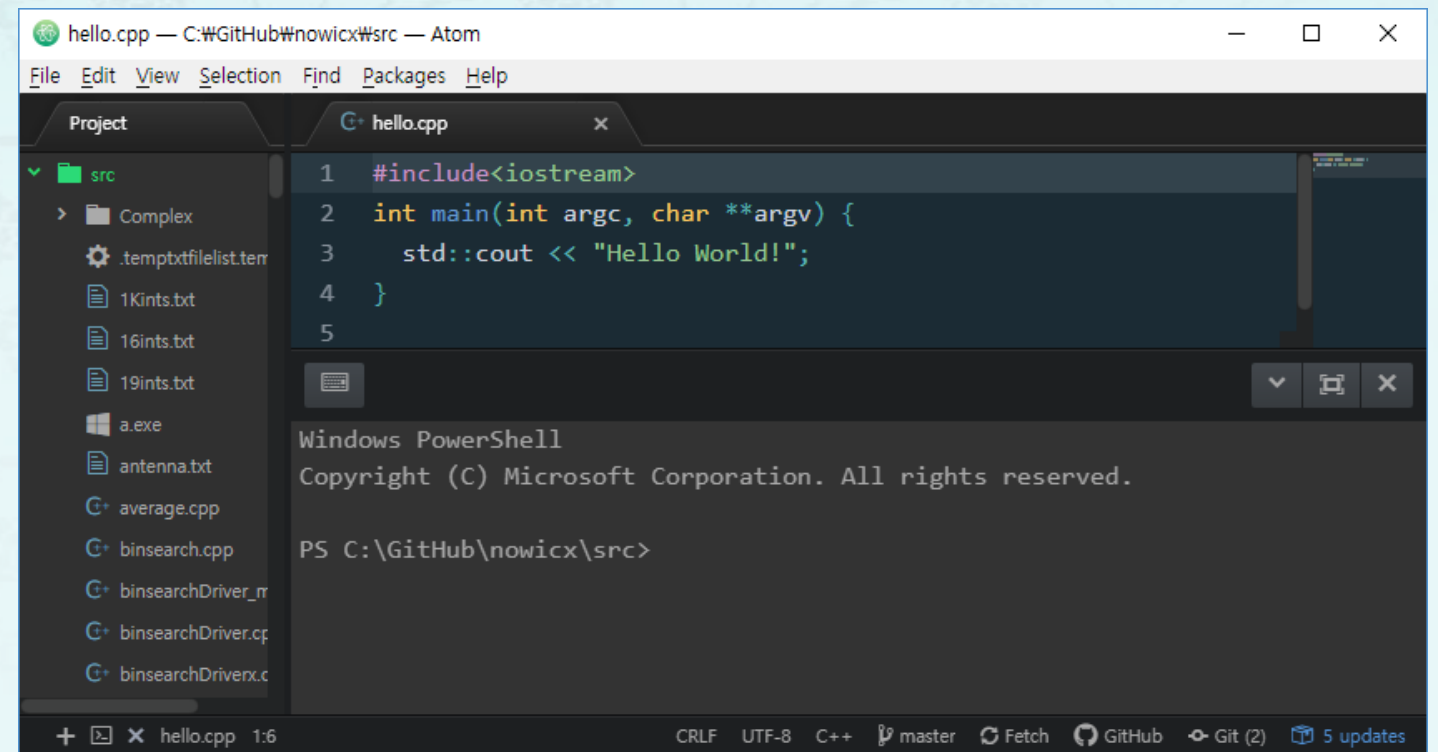

Install Atom

1. Install **Atom**.
2. Start Atom to edit a text file at a console.
 - start a console (or console window)
 - select Windows PowerShell
 - start the following command at console
atom hello.cpp
3. Add the following packages
 - platformio-ide-terminal
 - file-icons
 - minimap
 - **autocomplete-clang**

A screenshot of a Windows PowerShell window. The title bar says "Windows PowerShell". The text inside shows the copyright notice for Microsoft Corporation and the command "atom hello.cpp" being executed in the directory "C:\GitHub\nowicx\src".

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

PS C:\GitHub\nowicx\src> atom hello.cpp
PS C:\GitHub\nowicx\src>
```



Install Git and GitHub Desktop

- **Git**
 - a revision control system,
 - a tool to manage your source code history
 - **Github**
 - a hosting service for Git repositories.
 - **Github Desktop**
 - a Windows interface for Git/GitHub,
 - a subset of Git commands supported
1. Install Git.
 2. Install Github Desktop
 3. Clone the following repository
 - github.com/idebtor/nowic



C++ for C Coders

- C
 - Dennis Ritchie
 - 1972
 - 29 Keywords
 - Imperative programming
 - Procedural programming
 - C++
 - Stroustrup
 - 1985
 - 63 Keywords by 1996
 - C++ as a better C
 - Imperative programming
 - Object-oriented programming
 - **Generic programming**
- “Swiss Army Knife”

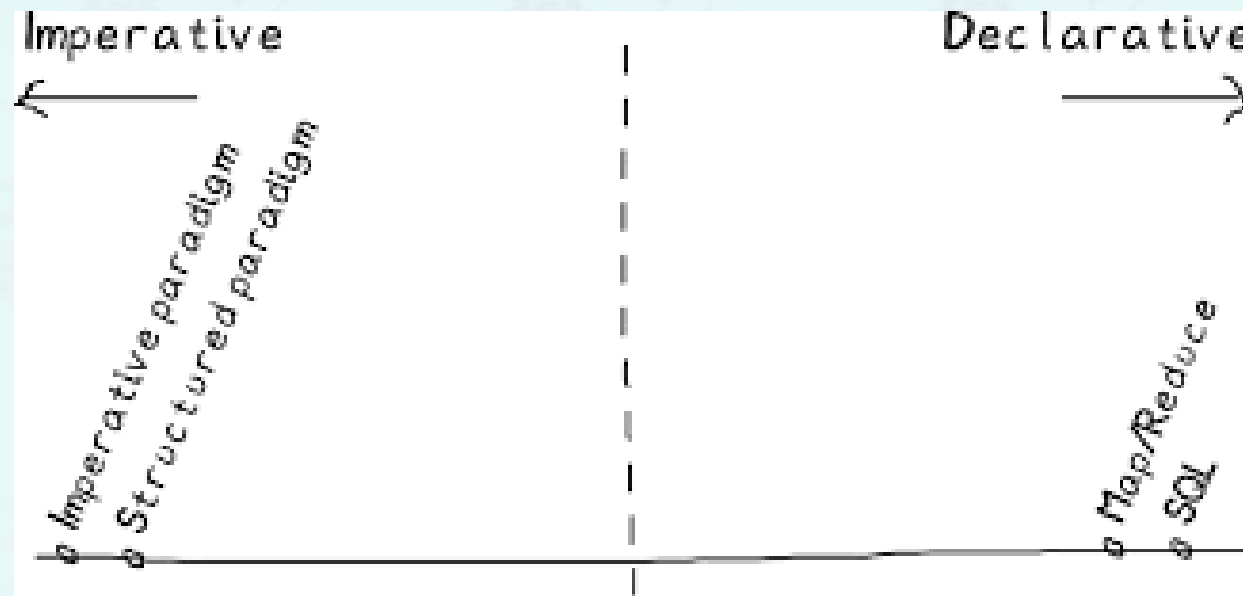
Imperative

Declarative programming

명령형 (C, C++, Java) vs 선언형 (Prolog, Haskell, SQL)

Imperative(명령형) vs Declarative(선언형) Programming

- The difference between these is generally described as such: declarative languages **tell the computer what to do**, while imperative languages **tell the computer how to do it**.
- Obviously, no languages completely fits into one side of this spectrum, but traditional Object-Oriented languages are generally considered to be more imperative than functional languages



- C,C++,Java

- Prolog, Haskell, SQL

In-house Programming Principles

- DRY or DIE
 - Don't repeat yourself, or Duplication is Evil.
 - To make you professional coders and save time.
- KISS
 - Keep it simple, stupid!, Keep it simple and short.
 - To make you professional coders – code maintainable
- NMN
 - No magic number
 - To make you professional coders - code robust.
- NSE
 - No side effects
 - To make you professional coders - code clean.

C++ specific keywords

<code>asm</code>	<code>dynamic_cast</code>	<code>namespace</code>	<code>reinterpret_cast</code>	<code>try</code>
<code>bool</code>	<code>explicit</code>	<code>new</code>	<code>static_cast</code>	<code>typeid</code>
<code>catch</code>	<code>false</code>	<code>operator</code>	<code>template</code>	<code>typename</code>
<code>class</code>	<code>friend</code>	<code>private</code>	<code>this</code>	<code>using</code>
<code>const_cast</code>	<code>inline</code>	<code>public</code>	<code>throw</code>	<code>virtual</code>
<code>delete</code>	<code>mutable</code>	<code>protected</code>	<code>true</code>	<code>wchar_t</code>

From C to C++

- Even if C++ is slanted toward object-oriented programming (OOP), you can nevertheless use any C++ compiler to compile C code and benefits from some C++ goodies.
- C++ as a better C

Write "Hello World" program in C++

- Open Atom editor

```
$ atom hello.cpp
```

- Add the source code.
- Save the file.

- Compile and Execute

```
$ g++ hello.cpp
```

```
$ ./a.exe
```

```
$ ./a
```

```
$ a
```

- Compile and Execute

```
$ g++ hello.cpp -o hello
```

```
$ ./hello.exe
```

```
$ ./hello
```

```
$ hello
```

```
// file: hello.cpp
#include <iostream>

int main() {
    std::cout << "Hello World!" << std::endl;
}
```

```
// file: hello.cpp
#include <iostream>
using namespace std;

int main() {
    cout << "Hello World!" << endl;
}
```


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