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## ATAD | Software Requirements

The installation of all the necessary software is presented, according to your operating system, in the following sections:

1. **Windows/WSL** or native **Linux**.
2. **MacOSX**.

If you are not able to perform a manual software installation, please see [Software\\_AlternativeMethods.pdf](#)

The *Docker Container* method is particularly advised to owners of Apple silicon machine owners, e.g., M1 and later chips. It is also a good option for Intel machines.

### Software Listing

The complete list of software is as follows:

- Windows Subsystem for Linux (Ubuntu LTS 20.04) – **windows-only**
- GNU Compiler Collection (GCC)
- GNU Project Debugger (GDB)
- GNU Make
- Git (already installed in Windows/WSL and Linux)
- Valgrind
- Doxygen
- Visual Studio Code (IDE):
  - (Extension) C/C++
  - (Extension) Doxygen Documentation Generator

### 1 | Windows/WSL or Linux

#### Requirements

The overall system requirements are the following:

- An updated installation of Windows 10/11 or a recent Linux distribution (all mainstream Linux distributions have the necessary packages);

- 
- 8GB of RAM;
  - 5GB of disk space for Windows/WSL (you'll be installing a base Linux environment), or an additional 500MB for a Linux machine.

## Installing

### Linux machine?

**Go to step 6 if you're on a native Linux environment.** The commands provided are for *Ubuntu/Debian* systems, but you should easily find the required packages for other distributions and transpose the commands to your package manager.

*Weblink:* [Install Windows Subsystem for Linux \(WSL\) on Windows 10 | Microsoft Docs](#)

1. Open PowerShell as Administrator, run the following command and restart.

```
PS> Enable-WindowsOptionalFeature -Online -FeatureName  
↳ Microsoft-Windows-Subsystem-Linux
```

2. Open **Microsoft Store** and search for "Ubuntu". Install **Ubuntu LTS 20.04 LTS**.
3. Run *Ubuntu* application and wait for installation.
4. During the installation you'll be asked for a **default UNIX user account**. Enter one (no spaces allowed and I recommend all lowercase letters) and your **password** (do not forget this password!)
5. The CLI will be presented afterwards.

## Updating Ubuntu image

*Weblink:* [Initialize a new WSL Linux distro | Microsoft Docs](#)

6. Update installed packages with:

```
$> sudo apt update && sudo apt upgrade
```

... this may take a few minutes. Drink some ☺.

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## Installing packages

7. Run the following command to install the necessary packages:

```
$> sudo apt install gcc gdb make valgrind doxygen
```

8. Make sure *git* is already installed (if it is, there is no need for reinstall):

```
$> sudo apt install git  
$> git --version
```

## Installing Visual Studio Code

9. Download and install **System installer 64bit** from [Download Visual Studio Code - Mac, Linux, Windows](#).
  - For windows users, it may be helpful to check:
    - [Get Started with C++ and Windows Subsystem for Linux in Visual Studio Code](#)

## VS Code Extensions

10. Install the following extensions from VS Code Marketplace (use the extension's **ID** to search for it):
  - Name: **C/C++**  
ID: ms-vscode.cpptools  
Description: C/C++ IntelliSense, debugging, and code browsing.  
Publisher: Microsoft  
[VS Marketplace Link](#)
  - Name: **Doxygen Documentation Generator**  
ID: cschlosser.doxdocgen  
Description: Let me generate Doxygen documentation from your source code for you.  
Publisher: Christoph Schlosser  
[VS Marketplace Link](#)

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## Test the environment

11. Clone the `CProgram_Template` course repository and test the toolchain (next section).

```
$> git clone https://github.com/estsetubal-atad/CProgram_Template.git
↪ FirstProgram
```

12. Open the project with *VS Code*:

```
$> code FirstProgram/
```

- **Note:** If you're **not using the *docker container*** methodology, when asked if you would like to “reopen folder to develop in a container”, **choose “Don’t Show Again”**. Otherwise, use that development option.

13. Within the editor you can make changes to the source files.

## Compiling (**make** and **gcc**)

14. Open the *integrated terminal*: Menu **Terminal** > **New Terminal**.

Invoke the makefile:

```
$> make
```

and run the program:

```
$> ./prog
```

## Debugging

15. Edit the source file `main.c` and put the following code inside the *main* function:

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```
int main() {  
  
    char str[30] = "Debugging in VS Code";  
  
    int i = 0; //Line 9. Place breakpoint here.  
    while(str[i] != '\0') {  
        printf("%c\n", str[i]);  
  
        i++;  
    }  
    printf("Done!");  
  
    return EXIT_SUCCESS;  
}
```

- Place a *breakpoint* in the line that contains the **while** instruction. You should get a red dot at that position.
- In the **Run and Debug** tab (leftmost side, with a “lady beetle”) you should now see a green play icon ► at the top beside “gdb - Debug project”. Click on it and the debug will start.
  - This will call **make debug** automatically and run **gdb** over the **prog** executable.
- In the **Variables** panel you can see the current values of **str** (all the positions of the array) and **i**. The variable **i** is not yet initialized, because this instruction at line **9** hasn’t been executed yet!
- Add the expression “**str[i]**” to the **Watch** list, before continuing;
- Now use the **Step Over (F10)** command to proceed line by line, watching the values change as the program executes.

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## 2 | MacOSX

**WARNING:** Please consider using **Docker container** method described in [Software\\_AlternativeMethods.pdf](#), as it will be easier and you’ll have the complete toolchain, guaranteed.

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If you're still aiming to manually install the software on your Mac computer, we'll be using **CLang** and **LLDB** which are themselves *forks* of GCC and GDB, but supported natively by Apple. Consequently, follow the next instructions.

## Install CLang

**CLang** may already be installed on your Mac. To verify that it is, open a macOS Terminal window and enter the following command:

```
$> clang --version
```

If **CLang** isn't installed, enter the following command to install the command line developer tools:

```
$> xcode-select --install
```

**git** is already included with XCode.

Turn off *security prompt* for debugging purposes:

```
$> sudo DevToolsSecurity --enable
```

## Install Doxygen

```
$> brew install doxygen
```

This should install fine, since it is supported across all major MacOSX versions.

## Install Valgrind

**WARNING:** *Valgrind* isn't supported for *Apple silicon*, i.e., M1 and later chips.

This is not a guaranteed installation. What has worked is the following:

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```
$> brew tap LouisBrunner/valgrind
```

Followed by:

```
$> brew install --HEAD LouisBrunner/valgrind/valgrind
```

These steps are from the following *git repository*: <https://github.com/LouisBrunner/valgrind-macos/>

### Install VS Code and extensions

**Follow steps 9 and 10 from the Installing Visual Studio Code section** process, e.g., VS Code and C/C++ and Doxygen extensions.

Additionally, install the **CodeLLDB** extension:

<https://marketplace.visualstudio.com/items?vadimcn.vscodelldb>

### Test the environment in MacOSX

**Follow steps 11 to 15 from the Installing Visual Studio Code section** process, but clone the following repository instead:

```
$> git clone https://github.com/estsetubal-atad/CProgram_Template_MacOS.git
↪ FirstProgram
```

This is a different repository that contains separate **makefile** and **launch.json** files for MacOS environments and the previous tools.

Also, when *debugging* you should see a green play icon ► at the top beside “lldb - Debug project”.

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## Troubleshooting

### WSL

Most of the times the problems arise from not enabling *Virtualization* on your BIOS settings.

References:

- <https://docs.microsoft.com/en-us/windows/wsl/troubleshooting>

### Cannot manually install?

Check [Software\\_AlternativeMethods.pdf](#) for alternative methods.

## Author and support

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You should ask your PL teacher for any help regarding these contents and procedures.