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# 1 ATAD | Software Requirements

You may run the necessary software through two main methods:

1. Manual software installation (**preferred, if possible**), or.
  - Either using Windows/WSL or native Linux.
2. Premade Virtual Box Appliance;

If you are not able to perform a manual software installation, the recommended *fallback* is through a virtual machine.

3. Manual installation for **MacOSX** (Apple machine) – see section.

## 1.1 Manual software installation

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
- Valgrind
- Doxygen
- Visual Studio Code (IDE):
  - (Extension) C/C++
  - (Extension) Doxygen Documentation Generator

**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.

### 1.1.1 Installing

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

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

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```
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.

### 1.1.2 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 coffee.

### 1.1.3 Installing compiler, debugger, memory checker and documentation generator

7. Run the following commands:

```
$> sudo apt install build-essential  
$> sudo apt install gdb  
$> sudo apt install valgrind  
$> sudo apt install doxygen
```

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

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

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#### 1.1.4 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](#)

#### 1.1.5 VS Code Extensions

10. Install the following extensions from VS Code Marketplace:
  - 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](#)

#### 1.1.6 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/
```

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

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## 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:

```
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 **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.

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- 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.

## 1.2 Virtual Box Appliances

There are two Linux appliances that you can import at:

[ATAD Linux Appliances - OneDrive](#)

One is based on Manjaro XFCE (more pretty, but needs more TLC, since its a rolling distribution); the other based on XUbuntu 19.10 (Ubuntu with XFCE).

Both we'll need 10Gb of disk space when imported; this includes 2,5Gb of free disk space. The *default* user configuration is:

- **Name:** ATAD
- **Username:** malloc
- **Password (sudoer):** realloc

## 1.3 Manual installation for MacOSX

We'll be using **CLang** and **LLDB** which are themselves *forks* of GCC and GDB, but supported natively by Apple.

Follow the next instructions by presented order.

### 1.3.1 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:

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```
clang --version
```

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

```
xcode-select --install
```

Turn off *security prompt* for debugging purposes:

```
sudo DevToolsSecurity --enable
```

### 1.3.2 Install Doxygen

```
brew install doxygen
```

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

### 1.3.3 Install Valgrind

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

```
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/>

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### 1.3.4 Install VS Code and extensions

**Follow steps 9 and 10 from the overall Manual Installation** process, e.g., VS Code and C/C++ and Doxygen extensions.

Additionally, install the **CodeLLDB** extension:

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

### 1.3.5 Test the environment in MacOSX

**Follow steps 11 to 15 from the overall Manual Installation** 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”.

## 1.4 Troubleshooting

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

## 1.5 Author and support

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Please follow the course *guidelines* when seeking support.