Setting Up Linux for CSE775 - DO

Jim Fawcett CSE775 – Distributed Objects Spring 2019

Tasks:

- Install VirtualBox
 - VMware Player would probably work as well
 - Download: https://www.virtualbox.org/wiki/Downloads
- Install a Debian Linux
 - I'll use Ubuntu 18.04
- Install "build essentials" tools
- Install Visual Studio Code (VS Code)
 - Setup build and launch tasks
- Optional Installs

Task #1 – Install Virtualbox

Installing Virtual Box

- I started by uninstalling Java and an old version of Virtualbox.
- Download and installation took about 2 minutes.
- https://www.virtualbox.org/wiki /Downloads
- Download Virtualbox extension pack and install



🥜 Virt	tualBox - Prefe	erences		?	×						
	General Extensions										
	Input	Extension Packages									
G	Update	Active	Name	Version							
	Language	~	Oracle VM VirtualBox Extension Pack	6.0.2r128	162 🙀						
	Display										
-	Network										
	Extensions										
	Proxy										
				ОК	Cancel						

Setting VM Guest Properties

? ×	? ×	? ×
← Create Virtual Machine	 Create Virtual Machine 	← Create Virtual Hard Disk
Memory size Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine. The recommended memory size is 1024 MB. 4 MB 16384 MB	 Hard disk If you wish you can add a virtual hard disk to the new machine. You can ether create a new hard disk file or select one from the list or from another location using the folder icon. If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created. The recommended size of the hard disk is 10.00 GB. Ipo not add a virtual hard disk Icreate a virtual hard disk now Use an existing virtual hard disk file 	 Hard disk file type Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged. VDI (VirtualBox Disk Image) VHD (Virtual Hard Disk) VMDK (Virtual Machine Disk)
<u>N</u> ext Cancel	Create Cancel	Expert Mode Next Cancel

Need more RAM than recommended

Setup Virtual Disk and install Ubuntu

? ×	? ×	? ×
← Create Virtual Hard Disk	 Create Virtual Hard Disk 	Select start-up disk
Storage on physical hard disk	File location and size	Select start-up disk
 Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size). A dynamically allocated hard disk file will only use space on your physical hard disk as it fills up (up to a maximum fixed size), although it will not shrink again automatically when space on it is freed. A fixed size hard disk file may take longer to create on some systems but is often faster to use. 	Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in. Ubuntu1804 Image: Comparison of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk. Image: Comparison of the virtual hard disk in the amount of file data that a virtual machine will be able to store on the hard disk.	Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from. The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.
Next Cancel	Create Cancel	Start Cancel
	You will need a lot more disk space than	Here's where you select the Ubuntu iso

the default setting

file after downloading.

Task #2 – Install Ubuntu

Download Ubuntu Desktop - 18.04.1 LTS

- Download Ubuntu (1.8GB)
 - https://www.ubuntu.com/downlo ad/desktop
 - Takes about 4 minutes
 - You get an iso image you install in Virtualbox.

• Install in Virtualbox



Select Ubuntu from Downloads folder



Installing Ubuntu

꾿 Ub	untu1804 [R	unning] -	Oracle V	M VirtualBo	x		_		×
File	Machine	View	Input	Devices	Help				
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The V	'irtual Machine	e reports th	hat the gue	est OS suppor	ts mouse p	ointer integ	ration. This		8 🔊
ubuntu®									
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File M	achine	View	Input	Devices	Help					
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Español Esperanto Euskara Français Gaeilge Galego Hrvatski Íslenska Italiano Kurdî Latviski Lietuviška Magyar Nederland No localize Norsk bok	i ds ation (UTF-i smål orsk	You thi: B) You	Try U u can try Ub s CD. if you're re- erating system u may wish	Ubuntu untu without ady, you can ir tem. This show	making any o nstall Ubunti uldn't take t lease notes.	L changes to y u alongside oo long.	nstall your com	Ubunt puter, dir ad of) yo	U rectly fro ur curren	om nt

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Installing Ubuntu (continued)



A few minutes later





Restarting



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Х

Now it's time to configure





Setting Scaling



Here's Scaled View

- The view is configured with the VM host, VirtualBox.
- Set menu bar icon sizes with settings > dock in Ubuntu



What do you know - It Works!



Update Ubuntu Installation using apt pkgmgr

jim@jim-VirtualBox: ~	-	jim@jim-VirtualBox: ~	- • •
File Edit View Search Terminal Help		File Edit View Search Terminal Help	
To run a command as administrator (user "root"), use "sudo <command/> ". See "man sudo_root" for details. jim@jim-VirtualBox:~\$ sudo apt-get update [sudo] password for jim: Hit:1 http://us.archive.ubuntu.com/ubuntu bionic InRelease Get:2 http://security.ubuntu.com/ubuntu bionic-security InRelease [83.2 k Get:3 http://us.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 Get:4 http://us.archive.ubuntu.com/ubuntu bionic-backports InRelease [74 Get:5 http://us.archive.ubuntu.com/ubuntu bionic-updates/main i386 Packag kB] Get:6 http://us.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packag kB] Get:7 http://us.archive.ubuntu.com/ubuntu bionic-updates/universe amd64 f [711 kB] Get:8 http://us.archive.ubuntu.com/ubuntu bionic-updates/universe i386 Pa [702 kB] Fetched 2,572 kB in 1s (1,965 kB/s) Reading package lists Done jim@jim-VirtualBox:~\$	kB] kB] .6 kB] ges [423 ages [48 Packages ackages	<pre>jim@jim-VirtualBox:~\$ sudo apt-get upgrade Reading package lists Done Building dependency tree Reading state information Done Calculating upgrade Done The following packages will be upgraded: gnome-software gnome-software-common gnome-software-plugin-snap gvfs gvfs-backends gvfs-bin gvfs-common gvfs-daemons gvfs-fuse gvfs-libs ubuntu-software 11 upgraded, 0 newly installed, 0 to remove and 0 not upgraded. Need to get 0 B/3,711 kB of archives. After this operation, 7,168 B of additional disk space will be used. Do you want to continue? [Y/n]</pre>	

Accessing usb Devices

😔 Ubuntu1804 - Settir	igs ? ?	×
General	USB	
System	Enable USB Controller	
Display	USB 1.1 (OHCI) Controller	
Storage	USB 2.0 (EHCI) Controller USB 3.0 (xHCI) Controller	
Audio	USB Device Filters	
Network	✓ New Filter 1	× ¢
Serial Ports		ß
✓ USB	· · · · · · · · · · · · · · · · · · ·	
Shared Folders		Ø
User Interface		
	ОК Салсе	



Using usb devices

- A bug in Virtualbox causes other devices, e.g., Bluetooth mouse, to fail.
- Restarting the VM resolves that problem.
- Large drives will probably fail to connect.



Task #3 – Install build-essential

gcc toolchain configured by Ubuntu team to build Ubuntu

- gcc (c/c++ compiler and linker)
- Make
- Many other tools

Install "build essential" gcc tool chain

jim@jim-VirtualBox: ~	• • •	jim@jim-VirtualBox: ~ 🛛 🔍 🔿 🔿
File Edit View Search Terminal Help		File Edit View Search Terminal Help
<pre>price cut view search reminial neip jim@jim-VirtualBox:~\$ sudo apt-get install build-essential Reading package lists Done Building dependency tree Reading state information Done The following additional packages will be installed: dpkg-dev fakeroot g++ g++-7 gcc gcc-7 libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan4 libatomic1 libc-dev-bin libc6-dev libcilkrts5 libfakeroot libgcc-7-dev libitm1 lib libmpx2 libquadmath0 libstdc++-7-dev libtsan0 libubsan0 linux-libc-dev manpages-dev Suggested packages: debian-keyring g++-multilib g++-7-multilib gcc-7-doc libstdc++6-7-dbg gcc-multilib autoconf automake libtool flex bison gcc-doc gcc-7-multili gcc-7-locales libgcc1-dbg libgomp1-dbg libitm1-dbg libatomic1-dbg libasan4-dbg liblsan0-dbg libtsan0-dbg libubsan0-dbg libcilkrts5-dbg</pre>	tab lsan0 make b	<pre>Setting up libc6-dev:amd64 (2.27-3ubuntu1) Setting up libitm1:amd64 (8.2.0-1ubuntu2~18.04) Setting up fakeroot (1.22-2ubuntu1) update-alternatives: using /usr/bin/fakeroot-sysv to provide /usr/bin/fakeroot (fakeroot) in auto mode Setting up libgcc-7-dev:amd64 (7.3.0-27ubuntu1~18.04) Setting up libstdc++-7-dev:amd64 (7.3.0-27ubuntu1~18.04) Setting up libalgorithm-merge-perl (0.08-3) Setting up libalgorithm-diff-xs-perl (0.04-5) Setting up gcc-7 (7.3.0-27ubuntu1~18.04) Setting up gcc-7 (7.3.0-27ubuntu1~18.04) Setting up gcc (4:7.3.0-3ubuntu2-1) Setting up gcc (4:7.3.0-3ubuntu2-1) Setting up g++ (4:7.3.0-3ubuntu2-1) Setting up g++ (4:7.3.0-3ubuntu2-1) Setting up build-essential (12.4ubuntu1)</pre>
libmpx2-dbg libquadmath0-dbg glibc-doc libstdc++-7-doc make-doc The following NEW packages will be installed:		Processing triggers for libc-bin (2.27-3ubuntu1) jim@jim-VirtualBox:~\$ gccversion
<pre>build-essential dpkg-dev fakeroot g++ g++-7 gcc gcc-7 libalgorithm-diff libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan4 libatomic1 libc-dev-bin libc6-dev libcilkrts5 libfakeroot libgcc-7-dev libitm1 lib libmpx2 libquadmath0 libstdc++-7-dev libtsan0 libubsan0 linux-libc-dev manpages-dev</pre>	-perl lsan0 make	gcc (Ubuntu 7.3.0-27ubuntu1~18.04) 7.3.0 Copyright (C) 2017 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.
0 upgraded, 27 newly installed, 0 to remove and 0 not upgraded.		jim@jim-VirtualBox:~\$

Task #4 – Install VS Code

Download and Install Visual Studio Code





Follow directions on this page. You can't just apt-get install.

Adding C++ Plugin

- Click on plugin icon
 - Bottom of left pane
- Select C/C++
- This configures json setting files (partially)
- You must already have a C++ tool chain installed



VS Code – Building C++



Tasks.json and Launch.json



Makefile Example

// Hello.cpp

```
#include <iostream>
#include <string>
```

```
std::string makeString()
```

```
std::string str = "I am a string";
str += " with some appended text";
return str;
}
int main()
{
 std::cout << "\n Hello World!\n\n";
 std::cout << "\n " << makeString();
 std::cout << "\n\n";
}
```

```
# makefile - demo for Project #1
# Jim Fawcett, CSE775 - Distributed Objects, Spring 2019
# Notes:
    - Indentations must be a single Tab (not spaces)

    Dependencies are not indented

    commands are indented with single tab

all: hello clean
# link hello.o to create executable hello
# you may add additional object files as needed
hello: hello.o
        g++ hello.o -o hello
# compile Hello.cpp to create object file hello.o
# you may add additional source files as needed
hello.o: Hello.cpp
        g++ -c -g -Wall Hello.cpp -o hello.o
# remove object files
# only called if cited in all: directive
clean:
        rm *.o
```

Running make

- Terminal > Run Task > make
- Builds application as specified by makefile

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*		PROBLEMS OUTPUT TERMINAL ··· 3: Task - make > Executing task: make < g++ -c -g -Wall Hello.cpp -o hello.o g++ hello.o -o hello rm *.o Terminal will be reused by tasks press any key to close it	□ ₪ ∕	^ ×
*	▶ OUTLINE			
😣 0 🗛	0 ▶ (gdb) Launch (Hello) Ubuntu Sof	makeString() Ln 7, Col 1 Spaces: 2 UTF-8 LF C++	- Linux 🙂	4 1
٩	Solution (19) (19) (19) (19) (19) (19) (19) (19)	 a 🎉 🖂 🕺 🗹 		Pight Ctrl

Debugging hello: Debug > Start Debugging

- Note breakpoint
- F10 => single step
- F5 => go to next breakpoint
- Note call stack
- Note Terminal

🚩 Ubun	tu1804 (ToolInstallationFinished) [Runnir	ng] - Oracle VM VirtualBox		-		×
File N	Machine View Input Devices	Help				
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D	DEBUG (gdb) Launch	• • •	<pre>{} lau :: ▶ ? ! ! ♡ ■ } tasks.json {} c_cpp_properties.json 3 #include <iostream></iostream></pre>	<u>ि</u> छि		
с % &	 Locals str: <error: cannot<="" li=""> WATCH </error:>	t access memory.	<pre>4 #include <string> 5 6 std::string makeString() 7 8 std::string str = "I am a string"; 9 str += " with some appended text"; 10 return str; 11 9 12 int main()</string></pre>			T
Ē			<pre>12 int main() 13 { 14 std::cout << "\n Hello World!\n\n"; 15 std::cout << "\n " << makeString(); 16 std::cout << "\n\n"; 17 }</pre>			
	BREAKPOINTS					
	Hello.cpp	14	PROBLEMS OUTPUT TERMINAL ··· 2: cppdbg: hello • +	II Ô	^	×
	makeString[abi:cxx11	1]()() Hello.cpp				
	main()	Hello.cpp 15:1	Hello World!			
*						
⊗ 0 ⊿	0 🕨 (gdb) Launch (Hello)		makeString() Ln 7, Col 1 Spaces: 2 UTF-8 LF C+	+ Linux	€ 4	1
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```
// See https://go.microsoft.com/fwlink/?LinkId=733558
// for the documentation about the tasks.json format
"version": "2.0.0",
"tasks": [
    ſ
        "label": "gcc build",
        "type": "shell",
        "command": "g++",
                                  gcc build
        "args":[
            "-g", "Hello.cpp"
        ],
        "group": {
            "kind": "build",
            "isDefault": true
        },
        "problemMatcher": [
            "$gcc"
    },
        "label": "make",
        "type": "shell",
                                 make build
        "command": "make",
        "args":[
        ],
        "group": {
            "kind": "build",
            "isDefault": true
        },
        "problemMatcher": [
            "$gcc"
    }
```

Build and Launch JSON



Task #5 – Optional Installs

Download Asp.Net Core 2.2 (optional)

https://dotnet.microsoft.com/download/linux-package-manager/ubuntu18-04/sdk-2.2.102 Several detailed command line invocations are needed.

.NET Core 2.2 downloads for Linux, macOS, and Windows - Mozilla Firefox	- • •	jim@jim-VirtualBox: ~	e 🛛 😣
H .NET Core 2.2 downloads × +		File Edit View Search Terminal Help	
(i) ▲ https://dotnet.microsoft.com/download/dotnet-cc III (i) This site uses cookies for analytics, personalized content and ads. By continuing to browse this site, you agree to this use. Let	arn more	Runtime Environment: OS Name: ubuntu OS Version: 18.04 OS Platform: Linux RID: ubuntu.18.04-x64 Base Path: /usr/share/dotnet/sdk/2.2.103/	
≡ Microsoft		Host (useful for support): Version: 2.2.1	
.NET 🗸		Commit: 878dd11e62	
Have you tried ML.NET? It's a new machine learning framework made specifically for .NET developers.	> X	.NET CORE SDKS installed: 2.2.103 [/usr/share/dotnet/sdk] .NET Core runtimes installed: Microsoft.AspNetCore.All 2.2.1 [/usr/share/dotnet/shared/Microsoft.AspNetCore.All]	
.NET Core Preview Want to try out the latest preview? .NET Core 3.0.0-preview- 27122-01 is available. GET .NET CORE PREVIEW	/>	Microsoft.AspNetCore.App 2.2.1 [/usr/share/dotnet/shared/Microsoft.AspNetCore.App] Microsoft.NETCore.App 2.2.1 [/usr/share/dotnet/shared/Microsoft.NETCore.App] To install additional .NET Core runtimes or SDKs:	
.NET Core 2.2 downloads	Feedback	https://aka.ms/dotnet-download jim@jim-VirtualBox:~\$	

Gman – man page helper

- Install gman
 - Sudo apt install gman

gcc-7			
Name	Section		
gapplication	1	gcc-7 manual page	000
gatttool	1	File Edit View Search Terminal Help	
gcc	1	GCC(1) GNU	GCC(1)
gcc-7	1		
gcc-ar	1	NAME	
gcc-ar-7	1	gcc - GNU project C and C++ compiler	
gcc-nm	1	Even with Anto Borrow of India Second Second	
gcc-nm-7	1	SYNOPSIS	
gcc-ranlib	1	gcc [-c -S -E] [-std=standard]	
gcc-ranlib-7	1	[-g] [-pg] [-0 <u>level</u>]	
gcore	1	[-W <u>warn</u>] [-Wpedantic]	
gcov	1	[-I <u>dir</u>] [-L <u>dir</u>]	
gcov-7	1	[-D <u>macro</u> [= <u>defn</u>]] [-U <u>macro</u>]	
gcov-dump	1	[-foption] [-mmachine-option]	
gcov-dump-7	1	[-o <u>outfile] [@file] infile</u>	
gcov-tool	1		- 11
gcov-cool-/	1	Only the most useful options are listed here; see below	for the
geve	3	remainder. g ++ accepts mostly the same options as gcc .	
adbserver	1	DESCRIPTION	
adbus	1	DESCRIPTION	milation
adisk	8	when you invoke GCC, it normally does preprocessing, com	priation,
UUISK	<u> </u>	process at an intermediate stage. For example, the or	o stop this
		to run the linker. Then the output consists of object f	iles output by
		the assembler	cies output by
		Manual page acc. 7 1 az line 1 (press h for help or a to quit)	

gedit – installed with Ubuntu

y geott			
Open ▼ 🖪	Hello.cpp ~/code/Hello	Save =	
// Hello.cpp			
#include <iostrea< td=""><td>am></td><td></td><td></td></iostrea<>	am>		
{ std::cout << " }	\n Hello World!	\n\n";	

That's All Folks!