

## Abstract

Installing the Google Chrome browser from the official Google Chrome repository, as well as updating all installed software using the terminal on a Ubuntu virtual machine.

## Introduction

On the Ubuntu virtual machine, Google Chrome will be installed with the usage of a PPA, also known as the Personal Package Archives which has its own key it uses to sign its packages. To go further in-depth with how software packages are installed into the repositories, the configuration file called, '/etc/apt/sources.list' will be analyzed, because it holds information from remote repositories, such as the Google Chrome repository. The four different repositories on the Ubuntu machine-- Main, Restricted, Universe, Multiverse and their usages in the Ubuntu machine will be defined as well.

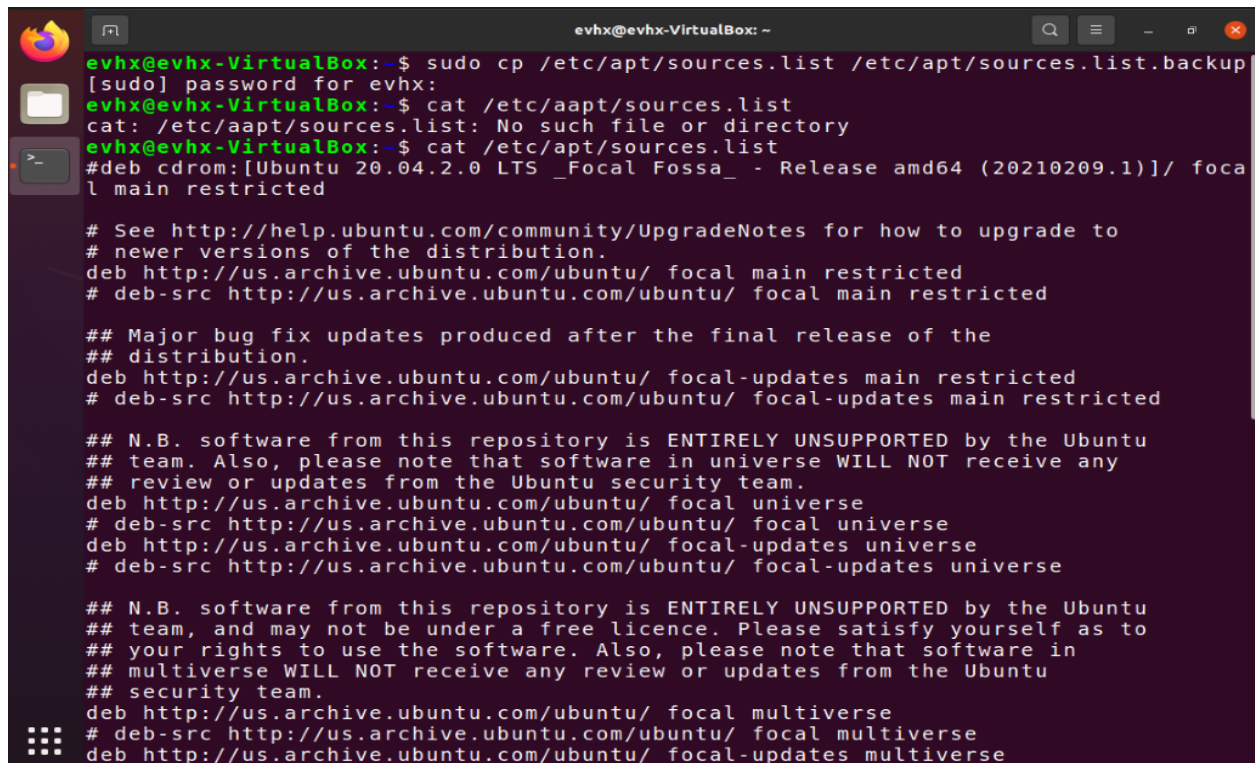
## Summary of Results

On the Ubuntu virtual machine, a backup of the '/etc/apt/sources.list' will be saved as '/etc/apt/sources.list.backup' to show the comparison of the file before and after the Google Chrome browser is installed in the repository. To create the backup file, use the command:

```
sudo cp /etc/apt/sources.list /etc/apt/sources.list.backup
```

Commands:

```
sudo          (root privileges)
cp            (copying files or directories to another location)
```



```
evhx@evhx-VirtualBox: ~  
[sudo] password for evhx:  
evhx@evhx-VirtualBox:~$ cat /etc/aapt/sources.list  
cat: /etc/aapt/sources.list: No such file or directory  
evhx@evhx-VirtualBox:~$ cat /etc/apt/sources.list  
#deb cdrom:[Ubuntu 20.04.2.0 LTS _Focal Fossa_ - Release amd64 (20210209.1)]/ focal  
l main restricted  
  
# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to  
# newer versions of the distribution.  
deb http://us.archive.ubuntu.com/ubuntu/ focal main restricted  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal main restricted  
  
## Major bug fix updates produced after the final release of the  
## distribution.  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates main restricted  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-updates main restricted  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team. Also, please note that software in universe WILL NOT receive any  
## review or updates from the Ubuntu security team.  
deb http://us.archive.ubuntu.com/ubuntu/ focal universe  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal universe  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates universe  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-updates universe  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team, and may not be under a free licence. Please satisfy yourself as to  
## your rights to use the software. Also, please note that software in  
## multiverse WILL NOT receive any review or updates from the Ubuntu  
## security team.  
deb http://us.archive.ubuntu.com/ubuntu/ focal multiverse  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal multiverse  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates multiverse
```

Let's view the contents of the 'sources.list' file with the command:

```
cat /etc/apt/sources.list
```

The first piece of information that is seen is the release name or version of the operating system being used, in this case it is:

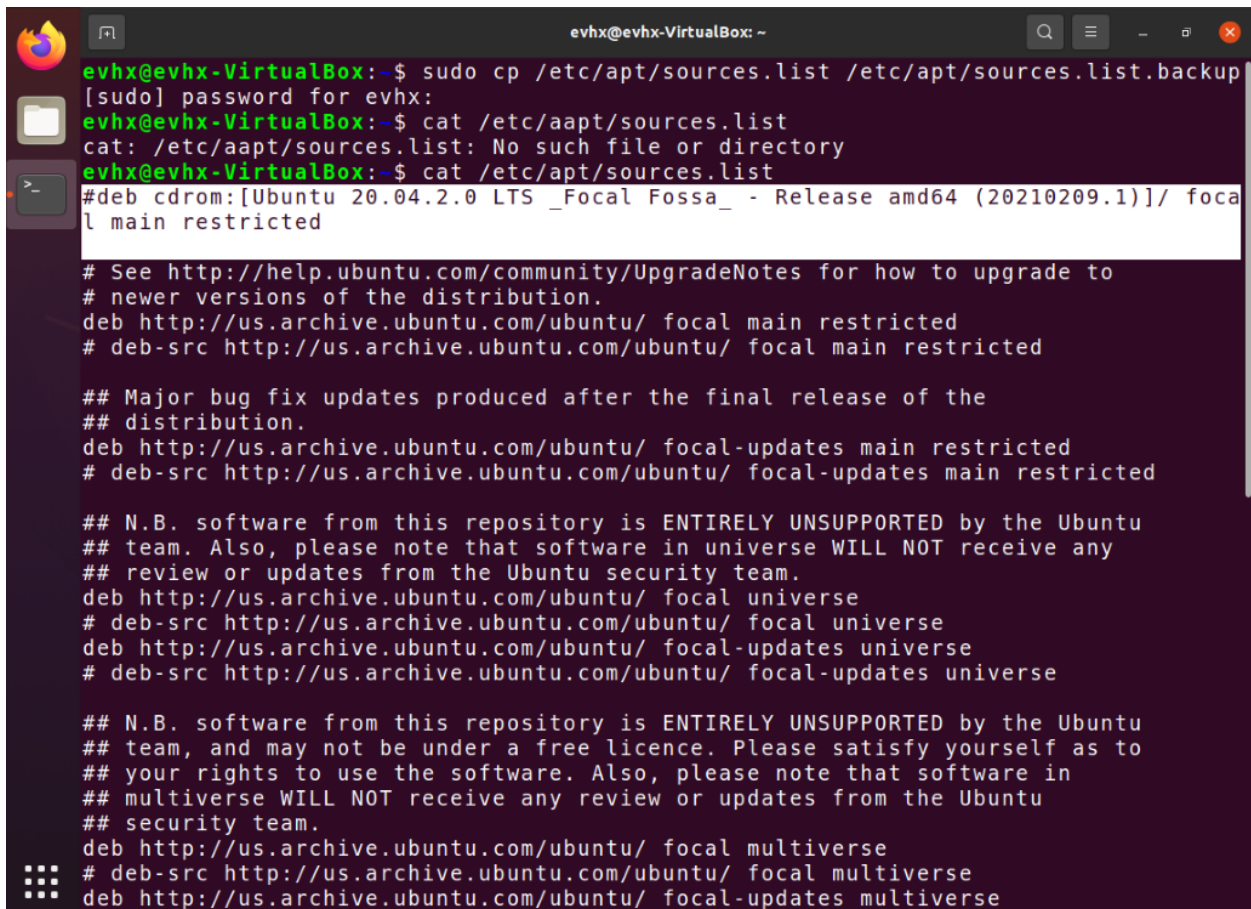
```
[Ubuntu 20.04.2.0 LTS _Focal Fossa_ - Release amd64 (20210209.1)]/ focal main restricted  
Release name: Focal Fossa
```

The 'main' and 'restricted' refer to the repositories located on the Ubuntu system. There are a total of four, which are:

Main	(Officially supported; Open-Source Software	)
Restricted	(Officially supported; Closed-Source Software	)
Universe	(Community maintained; Open-Source Software	)
Multiverse	(Unsupported; Closed-Source & Patent Restricted	)

Commands:

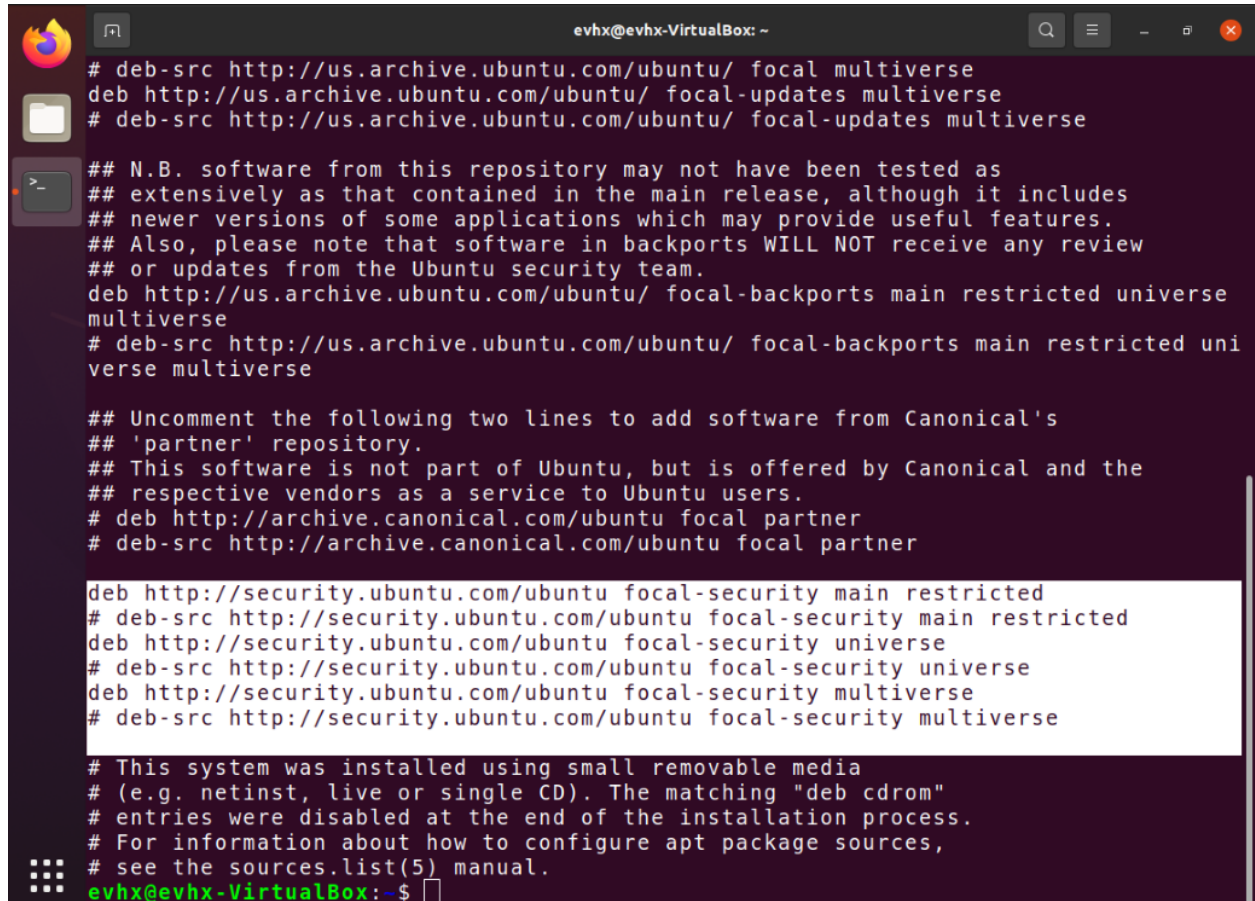
cat	(print the content of a file to standard output stream	)
-----	--------------------------------------------------------	---



```
evhx@evhx-VirtualBox: ~  
evhx@evhx-VirtualBox:~$ sudo cp /etc/apt/sources.list /etc/apt/sources.list.backup  
[sudo] password for evhx:  
evhx@evhx-VirtualBox:~$ cat /etc/aapt/sources.list  
cat: /etc/aapt/sources.list: No such file or directory  
evhx@evhx-VirtualBox:~$ cat /etc/apt/sources.list  
#deb cdrom:[Ubuntu 20.04.2.0 LTS _Focal Fossa_ - Release amd64 (20210209.1)]/ focal  
l main restricted  
  
# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to  
# newer versions of the distribution.  
deb http://us.archive.ubuntu.com/ubuntu/ focal main restricted  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal main restricted  
  
## Major bug fix updates produced after the final release of the  
## distribution.  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates main restricted  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-updates main restricted  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team. Also, please note that software in universe WILL NOT receive any  
## review or updates from the Ubuntu security team.  
deb http://us.archive.ubuntu.com/ubuntu/ focal universe  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal universe  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates universe  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-updates universe  
  
## N.B. software from this repository is ENTIRELY UNSUPPORTED by the Ubuntu  
## team, and may not be under a free licence. Please satisfy yourself as to  
## your rights to use the software. Also, please note that software in  
## multiverse WILL NOT receive any review or updates from the Ubuntu  
## security team.  
deb http://us.archive.ubuntu.com/ubuntu/ focal multiverse  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal multiverse  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates multiverse
```

Further down in the 'sources.list' file, the four repositories previously stated can be found. Typically with Ubuntu systems, only the 'Main' repository will be enabled by default, but the other repositories would have to be installed manually by using the commands:

sudo add-apt-repository universe	(adds the universe repository	)
sudo add-apt-repository restricted	(adds the restricted repository	)
sudo add-apt-repository multiverse	(adds the multiverse repository	)



```
evhx@evhx-VirtualBox: ~  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal multiverse  
deb http://us.archive.ubuntu.com/ubuntu/ focal-updates multiverse  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-updates multiverse  
  
## N.B. software from this repository may not have been tested as  
## extensively as that contained in the main release, although it includes  
## newer versions of some applications which may provide useful features.  
## Also, please note that software in backports WILL NOT receive any review  
## or updates from the Ubuntu security team.  
deb http://us.archive.ubuntu.com/ubuntu/ focal-backports main restricted universe  
multiverse  
# deb-src http://us.archive.ubuntu.com/ubuntu/ focal-backports main restricted uni  
verse multiverse  
  
## Uncomment the following two lines to add software from Canonical's  
## 'partner' repository.  
## This software is not part of Ubuntu, but is offered by Canonical and the  
## respective vendors as a service to Ubuntu users.  
# deb http://archive.canonical.com/ubuntu focal partner  
# deb-src http://archive.canonical.com/ubuntu focal partner  
  
deb http://security.ubuntu.com/ubuntu focal-security main restricted  
# deb-src http://security.ubuntu.com/ubuntu focal-security main restricted  
deb http://security.ubuntu.com/ubuntu focal-security universe  
# deb-src http://security.ubuntu.com/ubuntu focal-security universe  
deb http://security.ubuntu.com/ubuntu focal-security multiverse  
# deb-src http://security.ubuntu.com/ubuntu focal-security multiverse  
  
# This system was installed using small removable media  
# (e.g. netinst, live or single CD). The matching "deb cdrom"  
# entries were disabled at the end of the installation process.  
# For information about how to configure apt package sources,  
# see the sources.list(5) manual.  
evhx@evhx-VirtualBox:~$
```

The release name could also be seen using the command:

```
lsb_release -sc
```

Or to display all the information on the release, use the command:

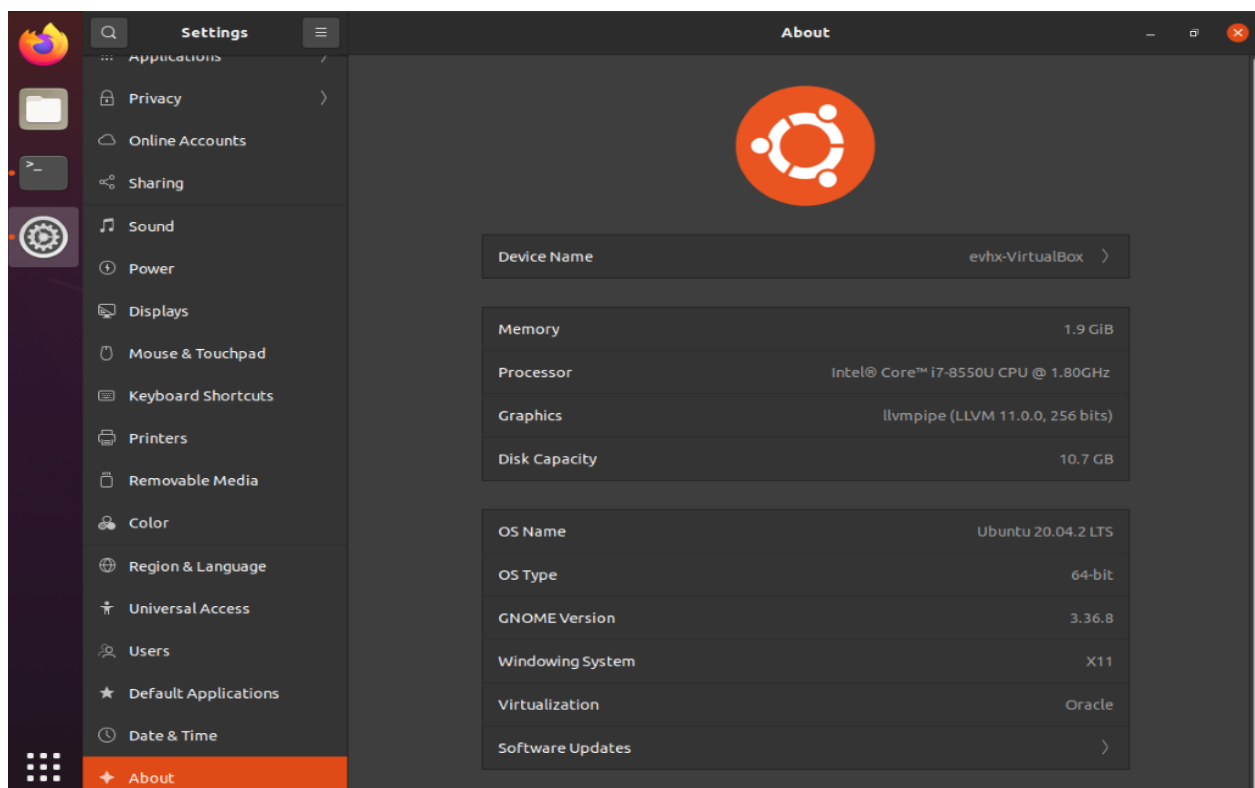
```
lsb_release -a
```

The same information can be viewed using the GUI by simply going into the ‘Settings’ menu, then going into the ‘About’ tab.

Commands:

<code>lsb_release</code>	(Linux Standard Base information about the Linux distribution used)
<code>-sc</code>	(short output format + codename)
<code>-a</code>	(all)

```
# For information about how to configure apt package sources,
# see the sources.list(5) manual.
evhx@evhx-VirtualBox:~$ lsb_release -sc
focal
evhx@evhx-VirtualBox:~$ lsb_release -a
No LSB modules are available.
Distributor ID: Ubuntu
Description:    Ubuntu 20.04.2 LTS
Release:        20.04
Codename:       focal
evhx@evhx-VirtualBox:~$
```



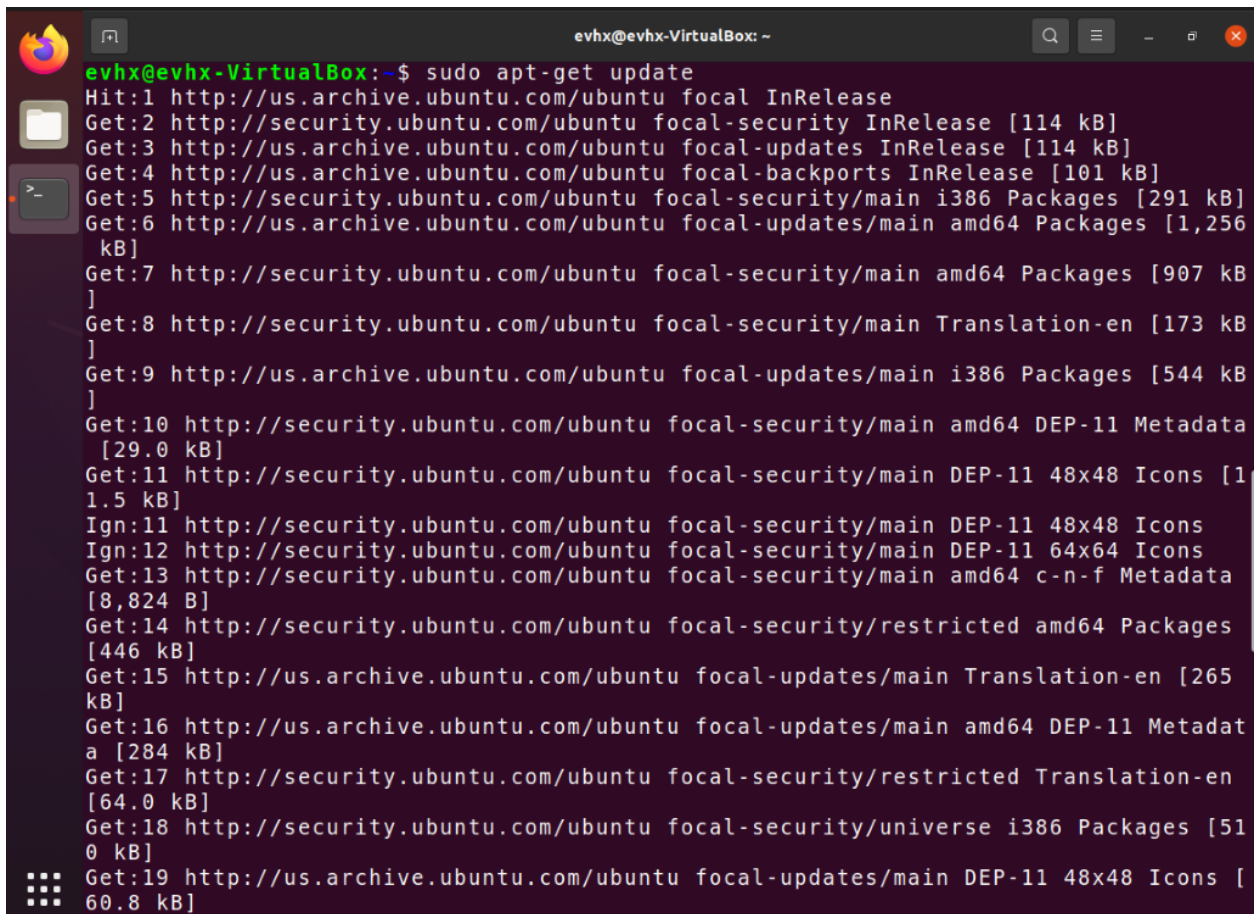
To save the selected sources on the system, update with the command:

```
sudo apt-get update
```

When the ‘sudo apt-get update’ command is run, the Ubuntu system uses its APT (Advanced Packaging Tool) to first check and store the information about the software in a cache before the new information is actually downloaded.

Commands:

sudo	(root privileges	)
apt-get	(retrieve information and packages	)
update	(newer than the existing corresponding files	)



```
evhx@evhx-VirtualBox: ~  
evhx@evhx-VirtualBox:~$ sudo apt-get update  
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease  
Get:2 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]  
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]  
Get:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]  
Get:5 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [291 kB]  
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1,256  
kB]  
Get:7 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [907 kB  
]  
Get:8 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [173 kB  
]  
Get:9 http://us.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [544 kB  
]  
Get:10 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata  
[29.0 kB]  
Get:11 http://security.ubuntu.com/ubuntu focal-security/main DEP-11 48x48 Icons [1  
1.5 kB]  
Ign:11 http://security.ubuntu.com/ubuntu focal-security/main DEP-11 48x48 Icons  
Ign:12 http://security.ubuntu.com/ubuntu focal-security/main DEP-11 64x64 Icons  
Get:13 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata  
[8,824 B]  
Get:14 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages  
[446 kB]  
Get:15 http://us.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [265  
kB]  
Get:16 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadat  
a [284 kB]  
Get:17 http://security.ubuntu.com/ubuntu focal-security/restricted Translation-en  
[64.0 kB]  
Get:18 http://security.ubuntu.com/ubuntu focal-security/universe i386 Packages [51  
0 kB]  
Get:19 http://us.archive.ubuntu.com/ubuntu focal-updates/main DEP-11 48x48 Icons [60.8 kB]
```

The PPA or Personal Package Archives are software repositories for Ubuntu users that are needed because of the lengthy procedures needed to check if software is compatible with the system. Using a PPA is a way around that procedure, since it allows the developers to create their own repositories so that the end user can simply add the PPA repository into the 'sources.list' file, which is how Google Chrome will be added to the Ubuntu machine.

First, to add the PPA for Google Chrome, the required public key needs to be downloaded, with the command:

```
wget -q -O - https://dl.google.com/linux/linux_signing_key.pub | sudo apt-key add -
```

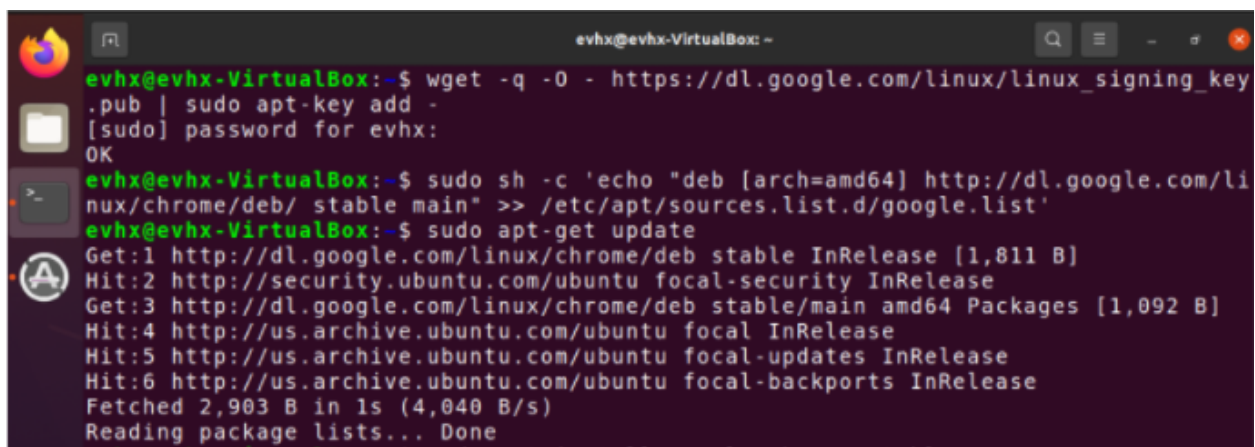
After the key is installed, the Google Chrome repository needs to be added to the 'sources.list', using the command:

```
sudo sh -c 'echo "deb [arch=amd64] http://dl.google.com/linux/chrome/deb/ stable main" >> /etc/apt/sources.list.d/google.list'
```

Commands:

wget	(downloads content from a web server	)
-q	('quiets' copyright message	)
-O	(Opera GPG key	)
https://dl.google.com/linux/linux_signing_key.pub	(key source	)
sudo apt-key add -	(pipeline used to add the package key into the other command)	

sh	(shell command to retrieve input	)
-c	(executes command using interpreter(shell)	)
"deb [arch=amd64] http://dl.google.com/linux/chrome/deb/ stable main"	(Google Chrome repository)	
>>	(accepts the input	)
/etc/apt/sources.list.d/google.list	(repository location of Google Chrome	)



```
evhx@evhx-VirtualBox: ~  
evhx@evhx-VirtualBox:~$ wget -q -O - https://dl.google.com/linux/linux_signing_key  
.pub | sudo apt-key add -  
[sudo] password for evhx:  
OK  
evhx@evhx-VirtualBox:~$ sudo sh -c 'echo "deb [arch=amd64] http://dl.google.com/li  
nux/chrome/deb/ stable main" >> /etc/apt/sources.list.d/google.list'  
evhx@evhx-VirtualBox:~$ sudo apt-get update  
Get:1 http://dl.google.com/linux/chrome/deb stable InRelease [1,811 B]  
Hit:2 http://security.ubuntu.com/ubuntu focal-security InRelease  
Get:3 http://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,092 B]  
Hit:4 http://us.archive.ubuntu.com/ubuntu focal InRelease  
Hit:5 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease  
Hit:6 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease  
Fetched 2,903 B in 1s (4,040 B/s)  
Reading package lists... Done
```



Now that the Google Chrome key was added, and the repository was set, the packages need to be installed, first with an update to the local cache with the command:

```
sudo apt-get update
```

To retrieve the remaining packages for Google Chrome, and compare the version in the created repository with the newer version, use the command:

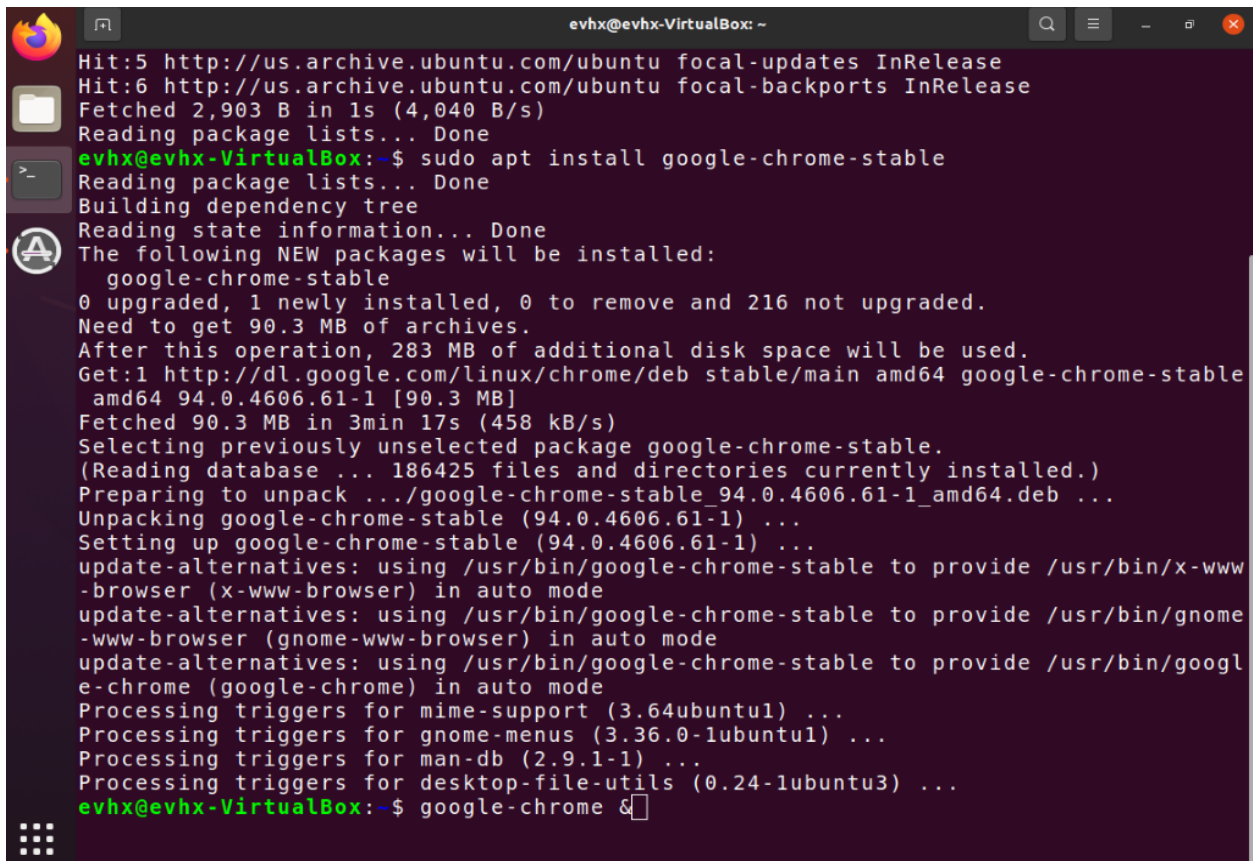
```
sudo apt install google-chrome-stable
```

To launch Google Chrome, use the command:

```
google-chrome &
```

Commands:

sudo	(root privileges)	)
apt	(check and store information)	)
-get update	(retrieves update)	)
install	(copy files)	)
google-chrome-stable	(Google Chrome package)	)
google-chrome	(program name)	)
&	(runs command in the background)	)

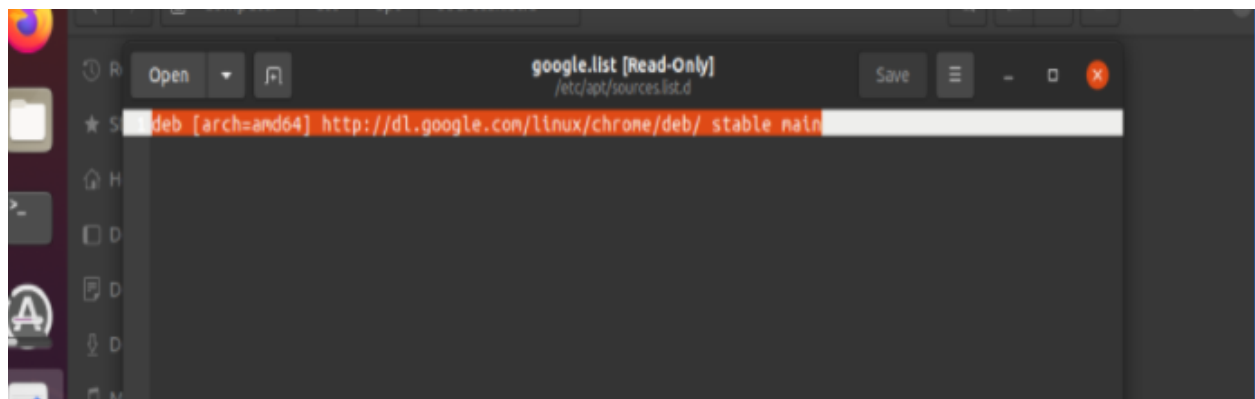
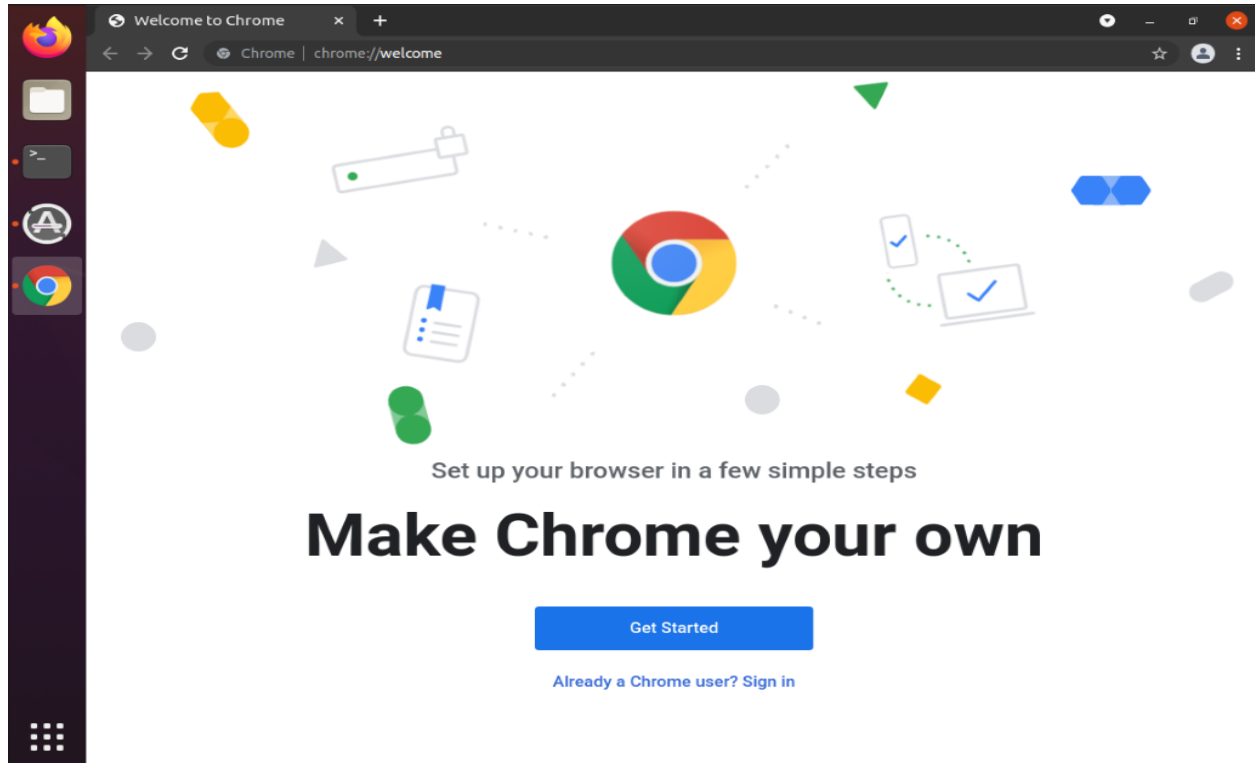


```
evhx@evhx-VirtualBox: ~  
Hit:5 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease  
Hit:6 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease  
Fetched 2,903 B in 1s (4,040 B/s)  
Reading package lists... Done  
evhx@evhx-VirtualBox:~$ sudo apt install google-chrome-stable  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following NEW packages will be installed:  
  google-chrome-stable  
0 upgraded, 1 newly installed, 0 to remove and 216 not upgraded.  
Need to get 90.3 MB of archives.  
After this operation, 283 MB of additional disk space will be used.  
Get:1 http://dl.google.com/linux/chrome/deb stable/main amd64 google-chrome-stable  
  amd64 94.0.4606.61-1 [90.3 MB]  
Fetched 90.3 MB in 3min 17s (458 kB/s)  
Selecting previously unselected package google-chrome-stable.  
(Reading database ... 186425 files and directories currently installed.)  
Preparing to unpack .../google-chrome-stable_94.0.4606.61-1_amd64.deb ...  
Unpacking google-chrome-stable (94.0.4606.61-1) ...  
Setting up google-chrome-stable (94.0.4606.61-1) ...  
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/x-www  
-browser (x-www-browser) in auto mode  
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/gnome  
-www-browser (gnome-www-browser) in auto mode  
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/googl  
e-chrome (google-chrome) in auto mode  
Processing triggers for mime-support (3.64ubuntu1) ...  
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...  
Processing triggers for man-db (2.9.1-1) ...  
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...  
evhx@evhx-VirtualBox:~$ google-chrome &
```

Google Chrome has been successfully installed. To view the Google Chrome repository stored on the Ubuntu machine, go into its saved location as previously stated being:

```
/etc/apt/sources.list.d/google.list
```

Here it shows the specific repository installed, the Google Chrome package name, 'stable', and its location in the 'Main' repository.





## **Conclusion**

Google Chrome was successfully installed on the Ubuntu virtual machine with the usage of Personal Package Archives, which allowed for the Google Chrome key to be added, the repository to be set and the packages to be downloaded. For a better understanding of how Google Chrome was able to be installed onto the Ubuntu system, the four repositories-- Main, Restricted, Universe, and Multiverse and their usages in the Ubuntu machine were reviewed, to show that the 'sources.list' located in the Main repository, can be used to add or upgrade applications on the Ubuntu machine.

Even though both the Yum system and the apt-get system are used for installing, removing and updating software packages, they can only be used with their specific Linux distributions. Yum is used with the Red Hat Linux distributions while apt-get is used with the Debian Linux distributions. Yum gets the packages from the net automatically, while apt-get is better for management since it's highly customizable and has more functionalities.