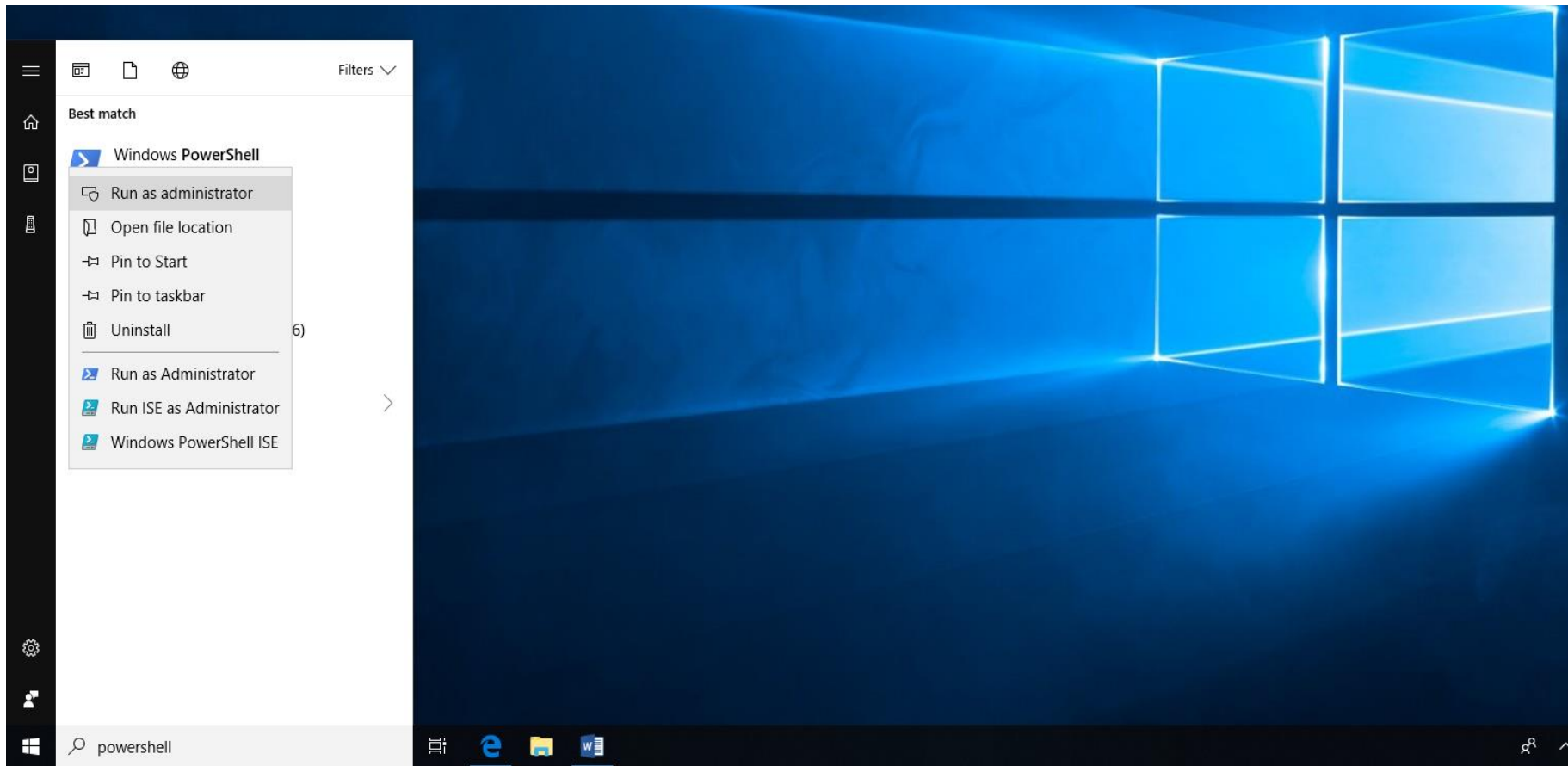


Using LIGGGHTS to Simulate Flexible Fibers

Matt Schramm

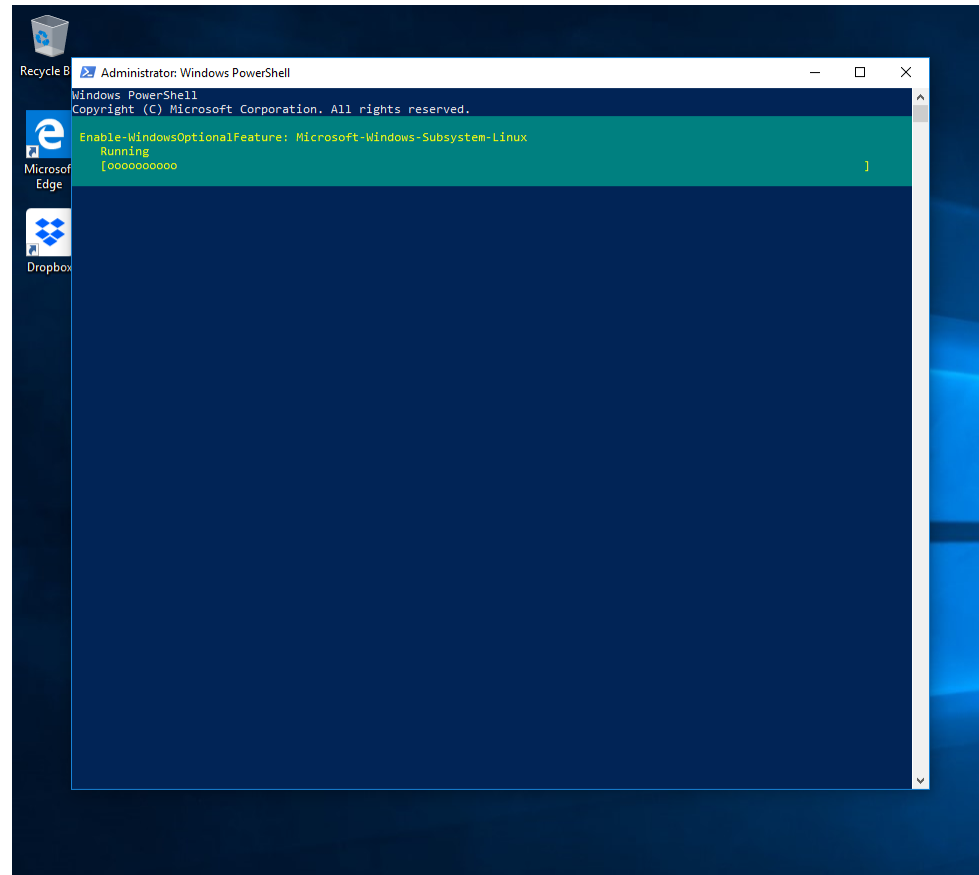
Install the Linux Subsystem for Windows 10 – Step 1

- Open Powershell as an administrator



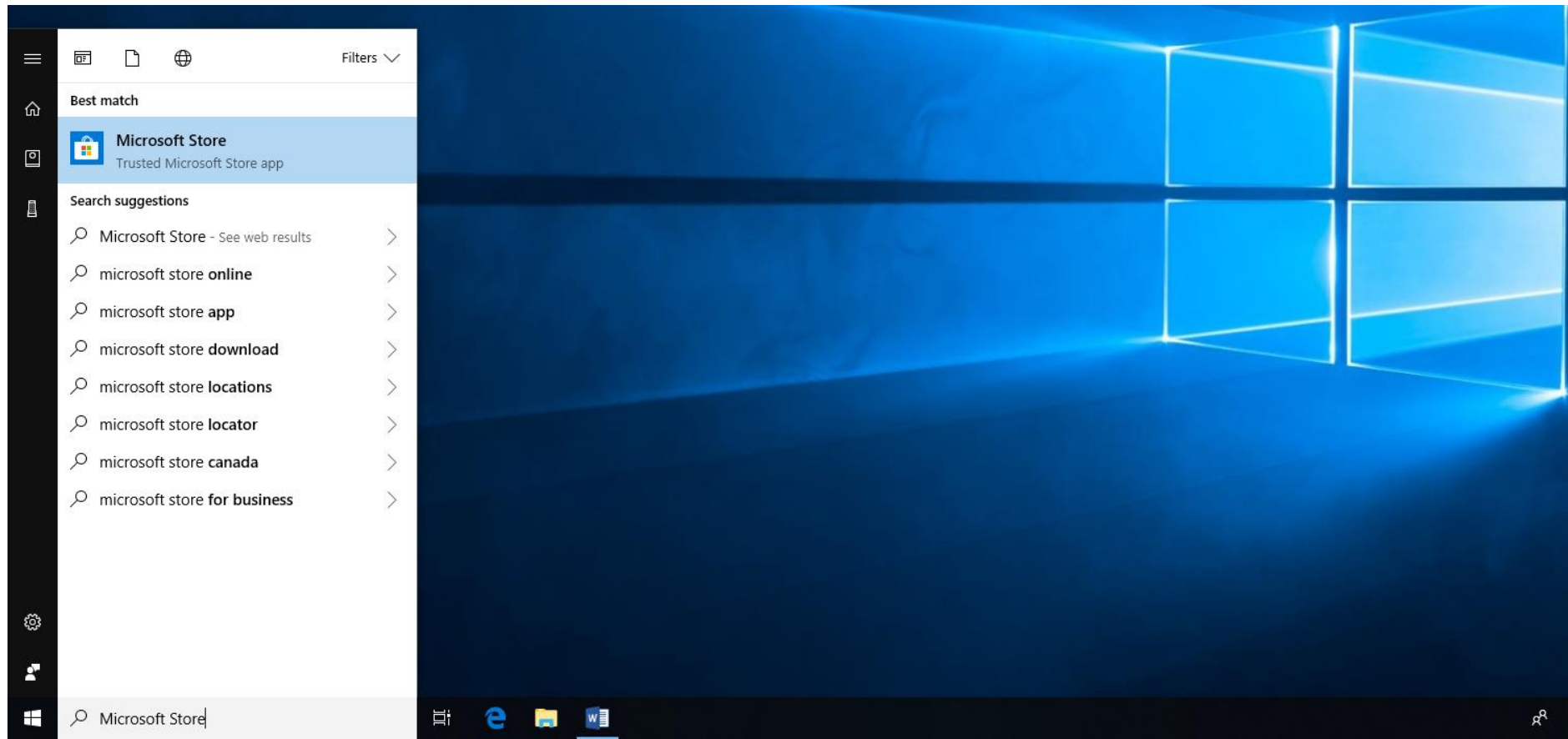
Install the Linux Subsystem for Windows 10 – Step 2

- Type the command (Enable-WindowsOptionalFeature -Online -FeatureName Microsoft-Windows-Subsystem-Linux)
- After Completion, restart your computer



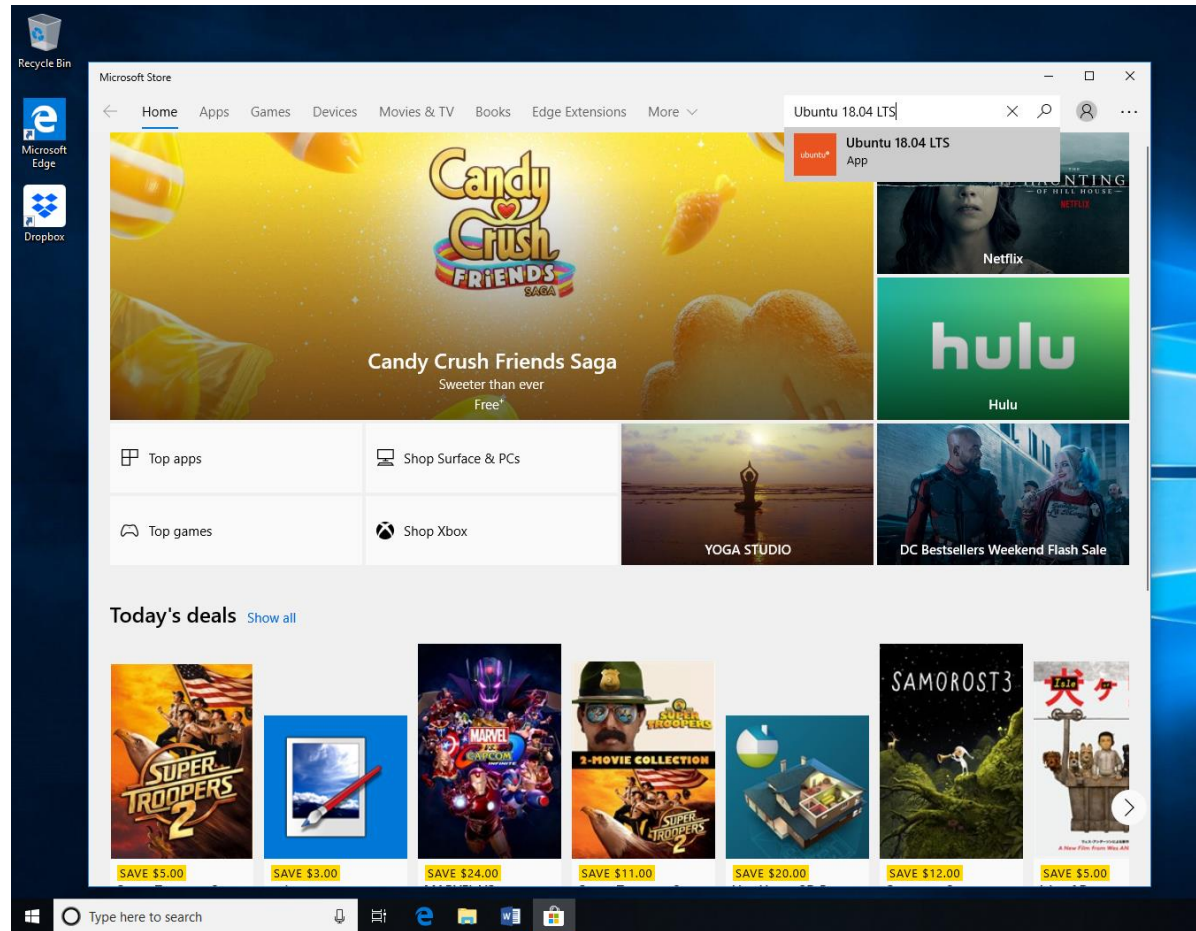
Install the Linux Subsystem for Windows 10 – Step 3

- Open the Microsoft Store



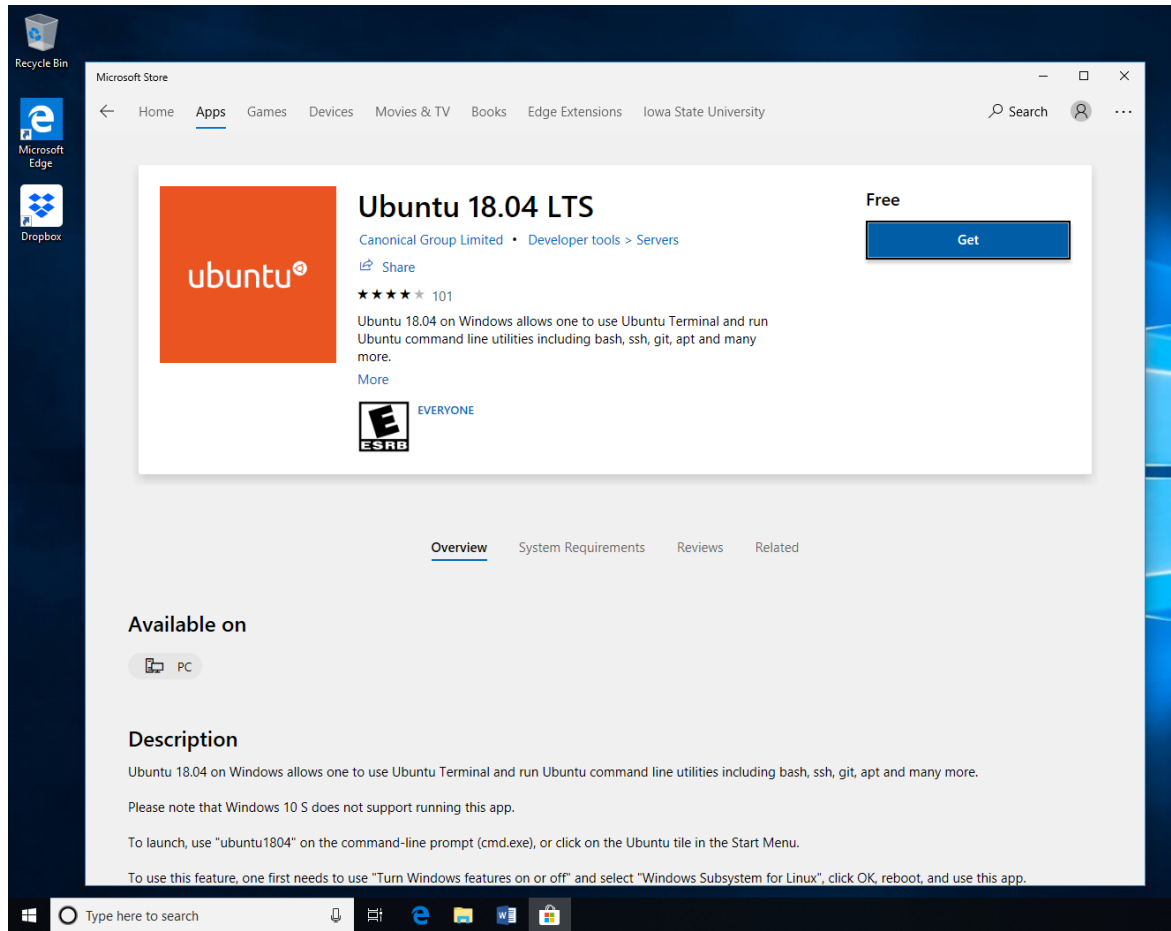
Install the Linux Subsystem for Windows 10 – Step 4

- Search for Ubuntu 18.04 LTS



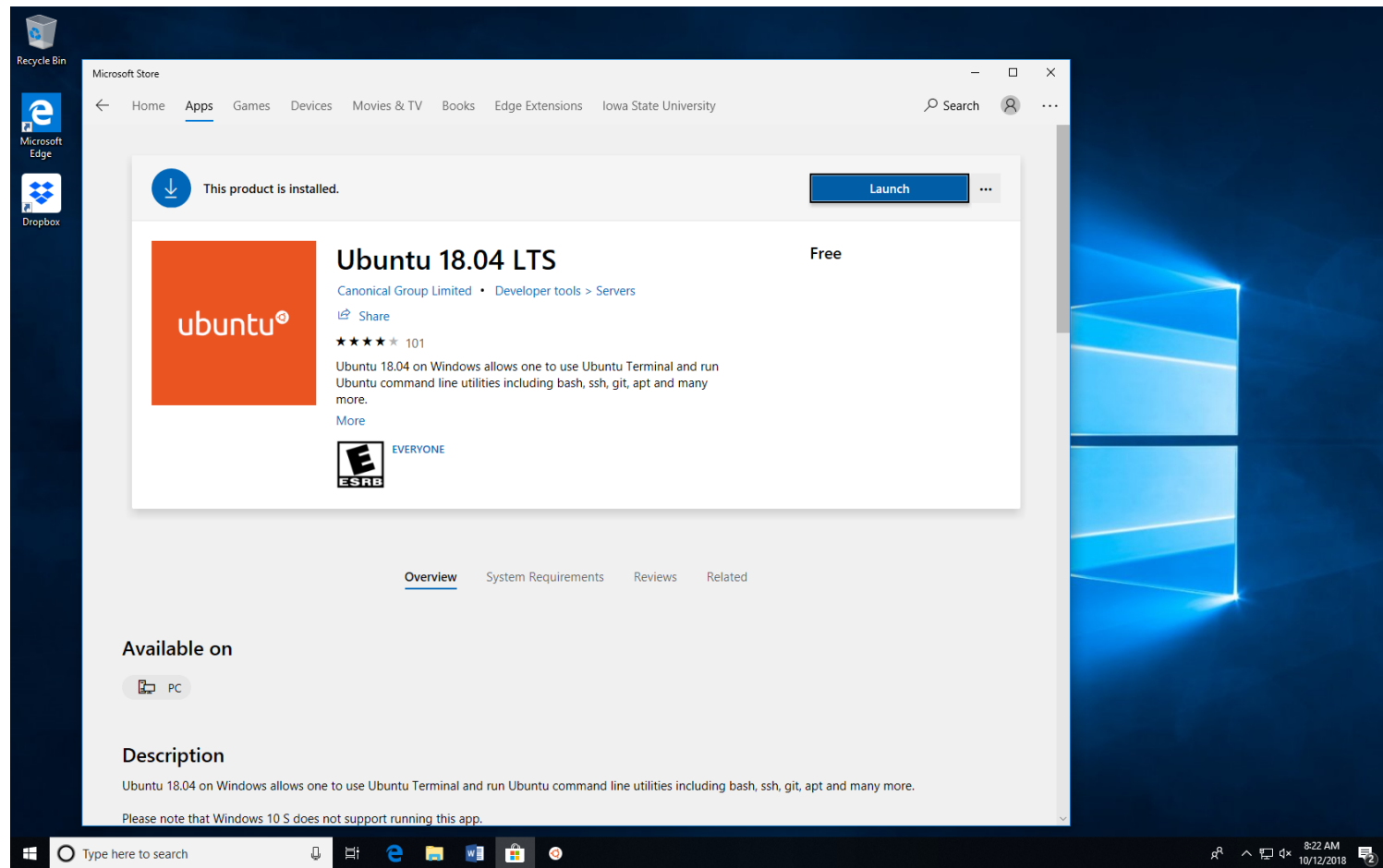
Install the Linux Subsystem for Windows 10 – Step 5

- Download Ubuntu 18.04 LTS



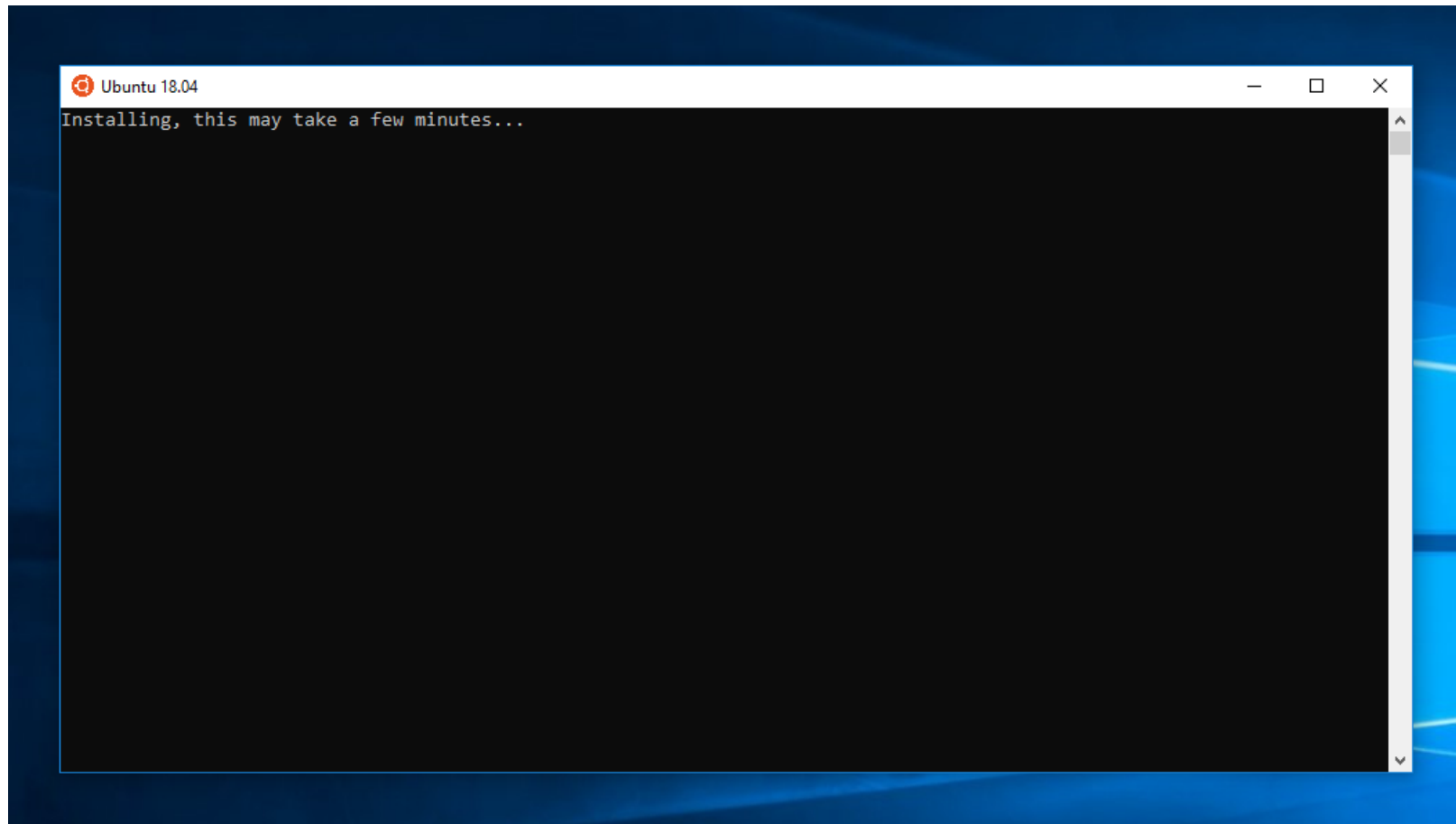
Install the Linux Subsystem for Windows 10 – Step 6

- Launch Ubuntu 18.04 LTS



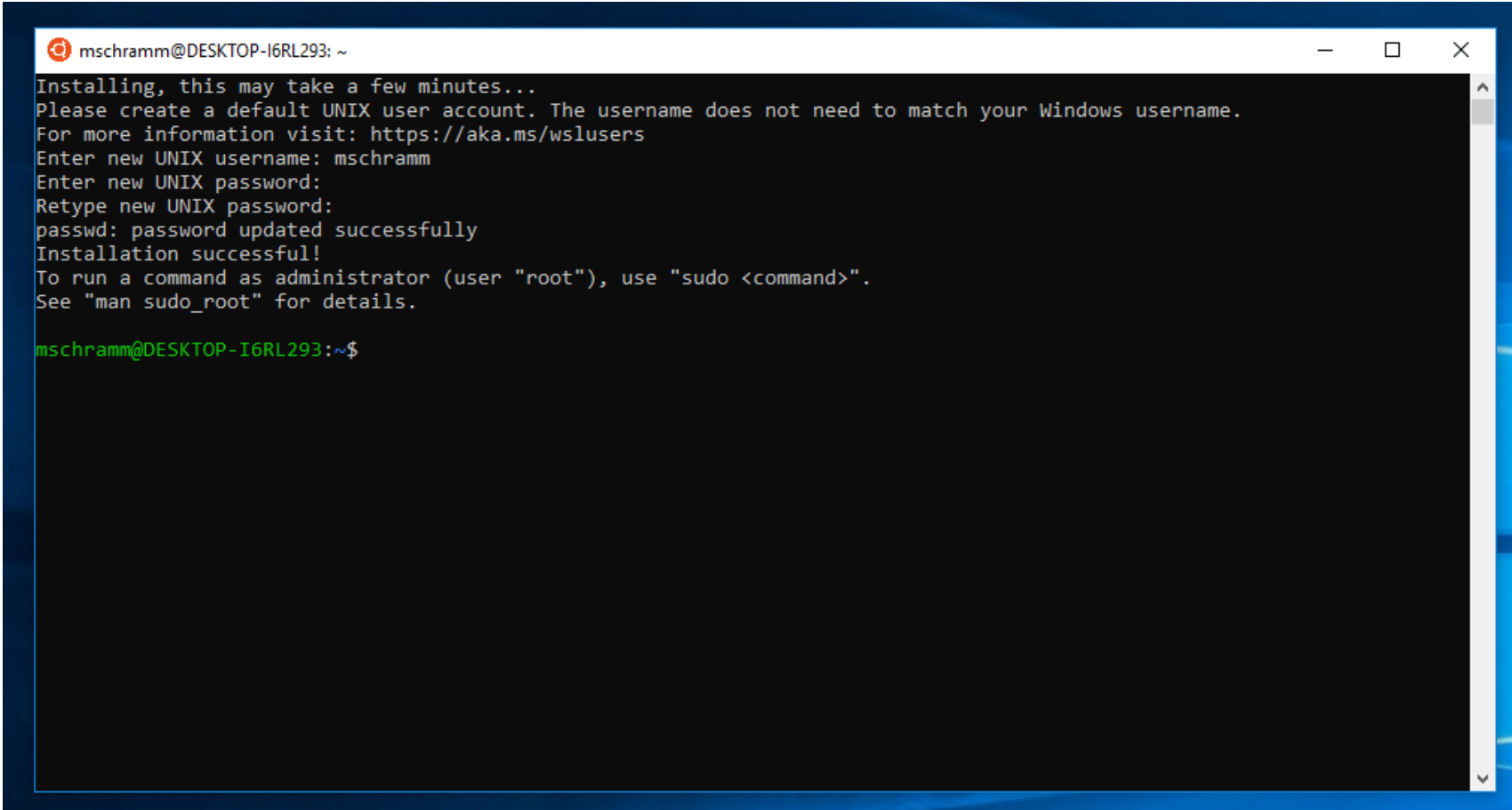
Install the Linux Subsystem for Windows 10 – Step 7

- Let Ubuntu install



Install the Linux Subsystem for Windows 10 – Step 8

- Make an account (username and password)

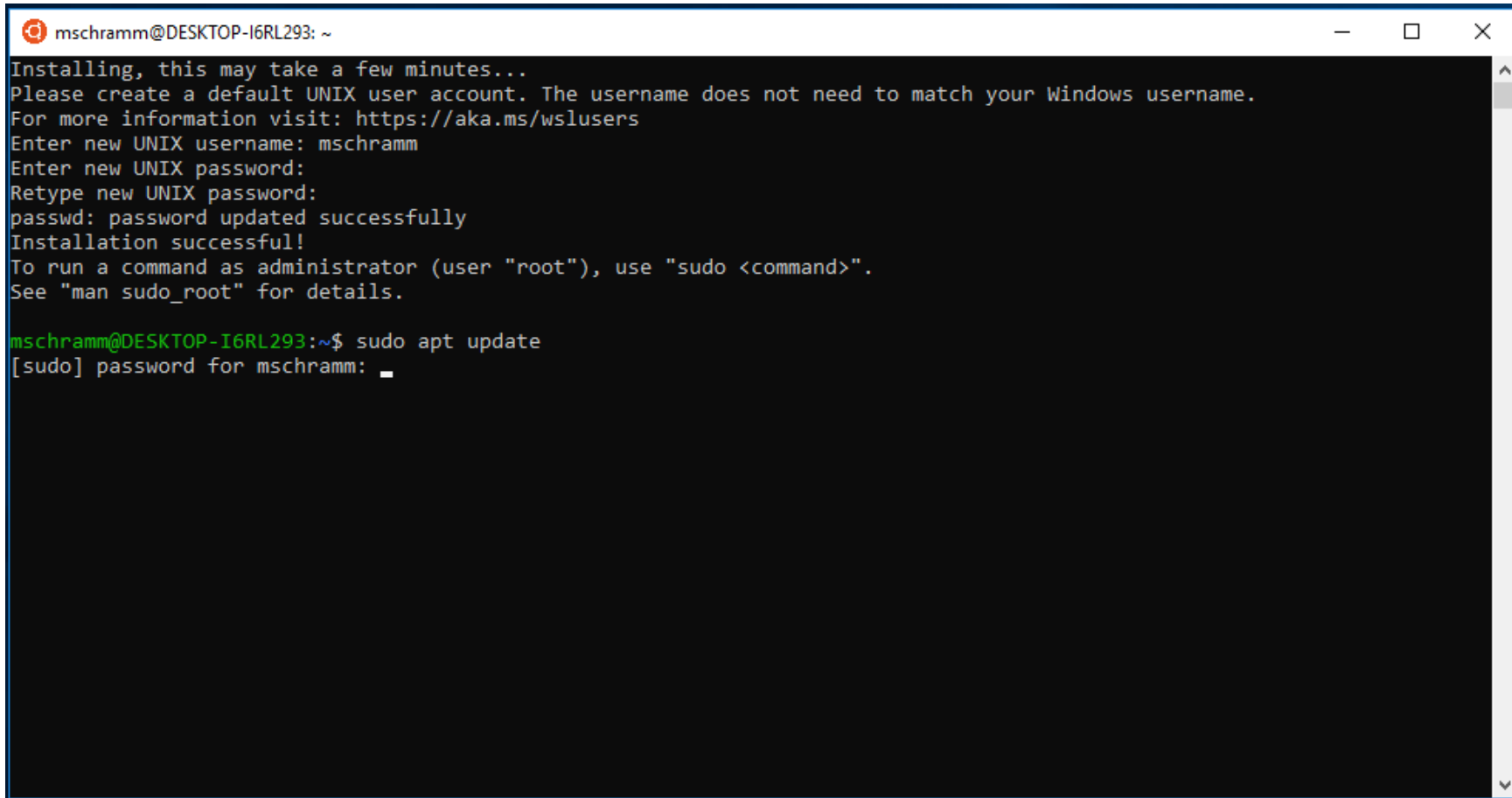


The screenshot shows a Windows terminal window titled "mschramm@DESKTOP-I6RL293: ~". The terminal output indicates the installation of the Linux Subsystem for Windows 10. It prompts the user to create a default UNIX user account, providing a link for more information. The user enters the username "mschramm" and a password, which is then confirmed. The installation is successful, and the terminal shows the prompt "mschramm@DESKTOP-I6RL293:~\$".

```
mschramm@DESKTOP-I6RL293: ~  
Installing, this may take a few minutes...  
Please create a default UNIX user account. The username does not need to match your Windows username.  
For more information visit: https://aka.ms/wslusers  
Enter new UNIX username: mschramm  
Enter new UNIX password:  
Retype new UNIX password:  
passwd: password updated successfully  
Installation successful!  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
mschramm@DESKTOP-I6RL293:~$
```

Install the Linux Subsystem for Windows 10 – Step 9

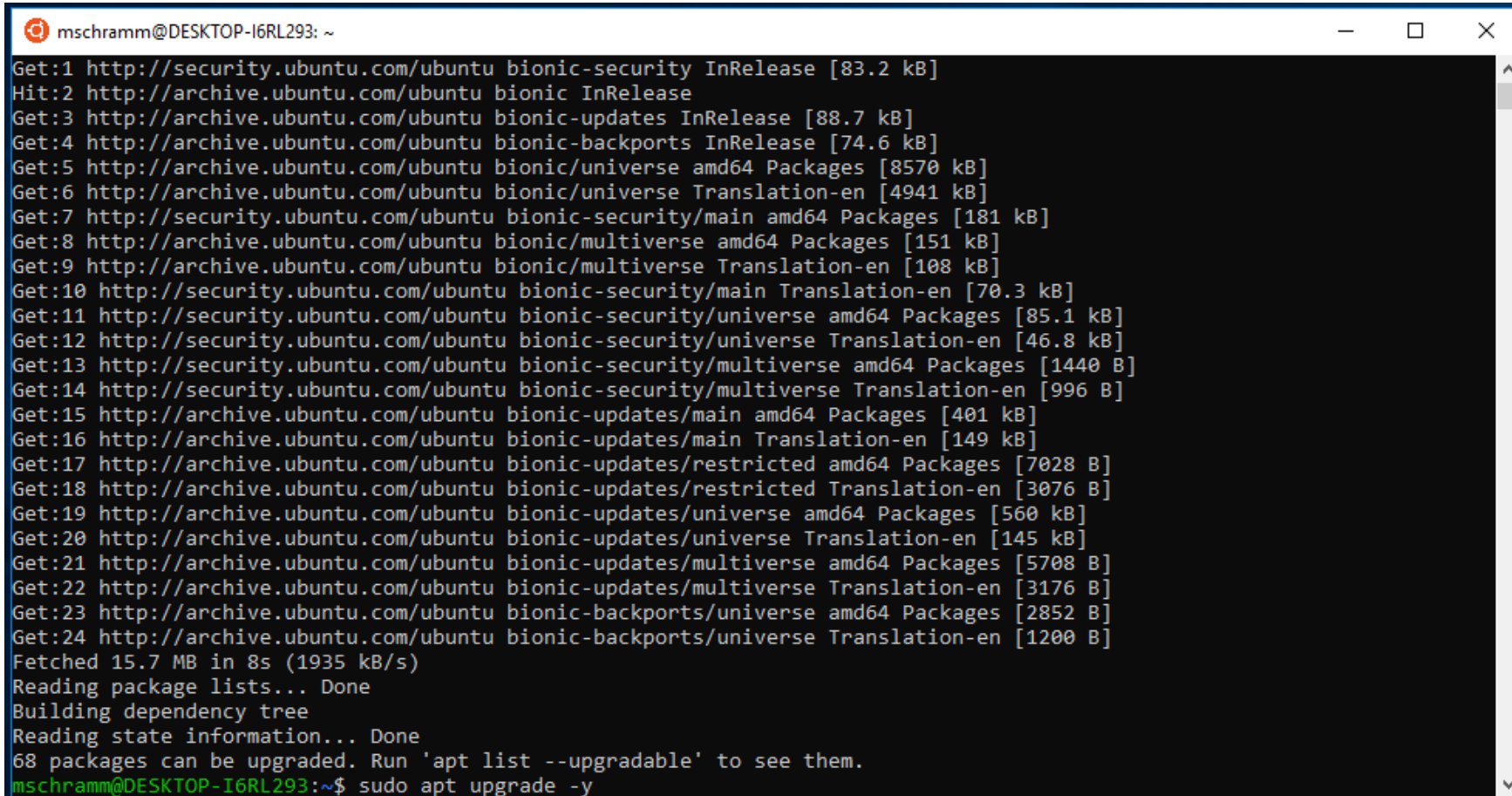
- Update the subshell



```
mschramm@DESKTOP-I6RL293: ~  
Installing, this may take a few minutes...  
Please create a default UNIX user account. The username does not need to match your Windows username.  
For more information visit: https://aka.ms/wslusers  
Enter new UNIX username: mschramm  
Enter new UNIX password:  
Retype new UNIX password:  
passwd: password updated successfully  
Installation successful!  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
mschramm@DESKTOP-I6RL293:~$ sudo apt update  
[sudo] password for mschramm: █
```

Install the Linux Subsystem for Windows 10 – Step 10

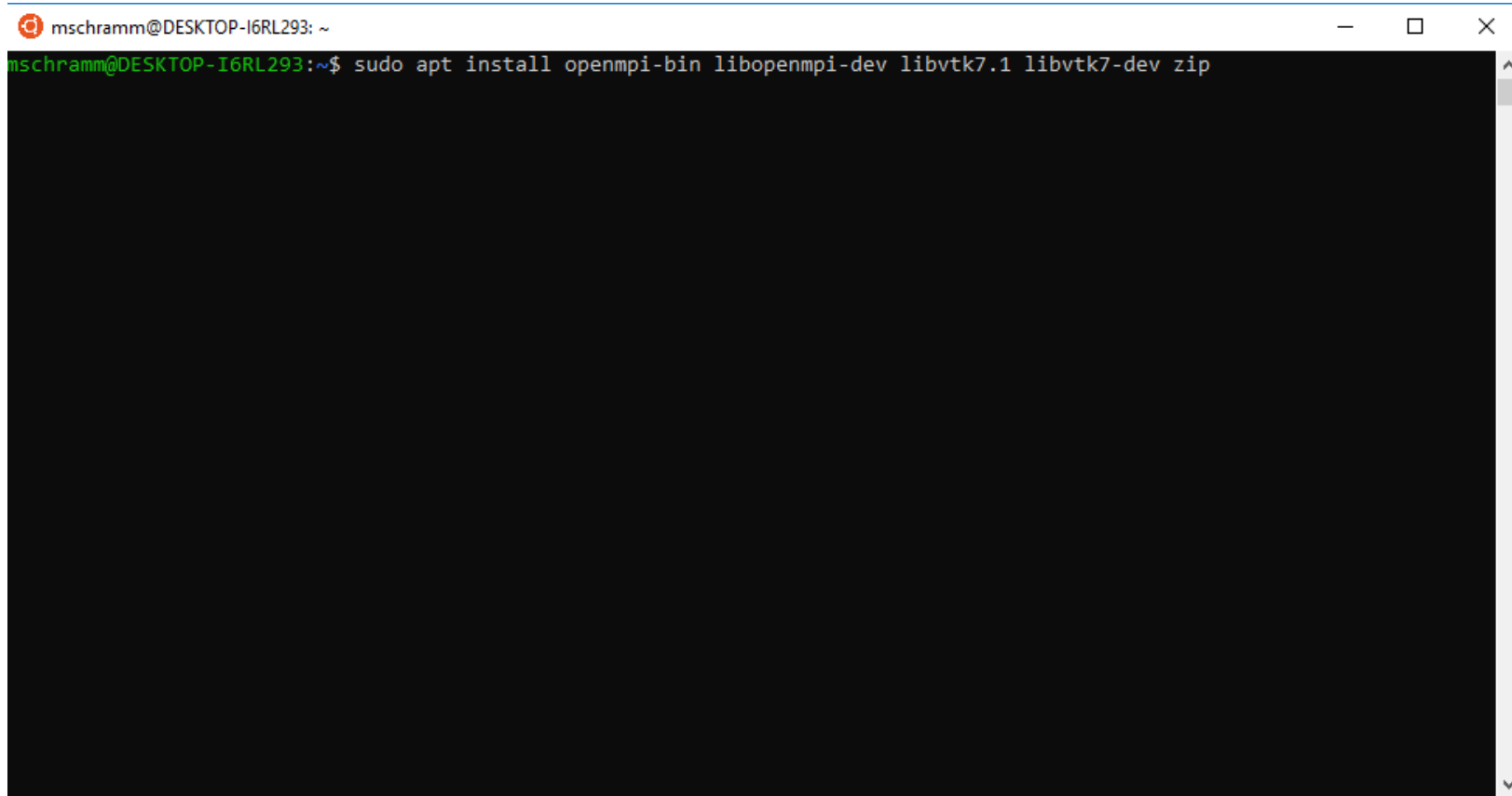
- Upgrade the subshell



```
mschramm@DESKTOP-I6RL293: ~
Get:1 http://security.ubuntu.com/ubuntu bionic-security InRelease [83.2 kB]
Hit:2 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:3 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:4 http://archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:5 http://archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8570 kB]
Get:6 http://archive.ubuntu.com/ubuntu bionic/universe Translation-en [4941 kB]
Get:7 http://security.ubuntu.com/ubuntu bionic-security/main amd64 Packages [181 kB]
Get:8 http://archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:9 http://archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:10 http://security.ubuntu.com/ubuntu bionic-security/main Translation-en [70.3 kB]
Get:11 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [85.1 kB]
Get:12 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [46.8 kB]
Get:13 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [1440 B]
Get:14 http://security.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [996 B]
Get:15 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [401 kB]
Get:16 http://archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [149 kB]
Get:17 http://archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [7028 B]
Get:18 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [3076 B]
Get:19 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [560 kB]
Get:20 http://archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [145 kB]
Get:21 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [5708 B]
Get:22 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [3176 B]
Get:23 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [2852 B]
Get:24 http://archive.ubuntu.com/ubuntu bionic-backports/universe Translation-en [1200 B]
Fetched 15.7 MB in 8s (1935 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
68 packages can be upgraded. Run 'apt list --upgradable' to see them.
mschramm@DESKTOP-I6RL293:~$ sudo apt upgrade -y
```

Install the Linux Subsystem for Windows 10 – Step 11

- Install dependencies by running the command “sudo apt install openmpi-bin libopenmpi-dev libvtk7.1 libvtk7-dev zip” then wait...

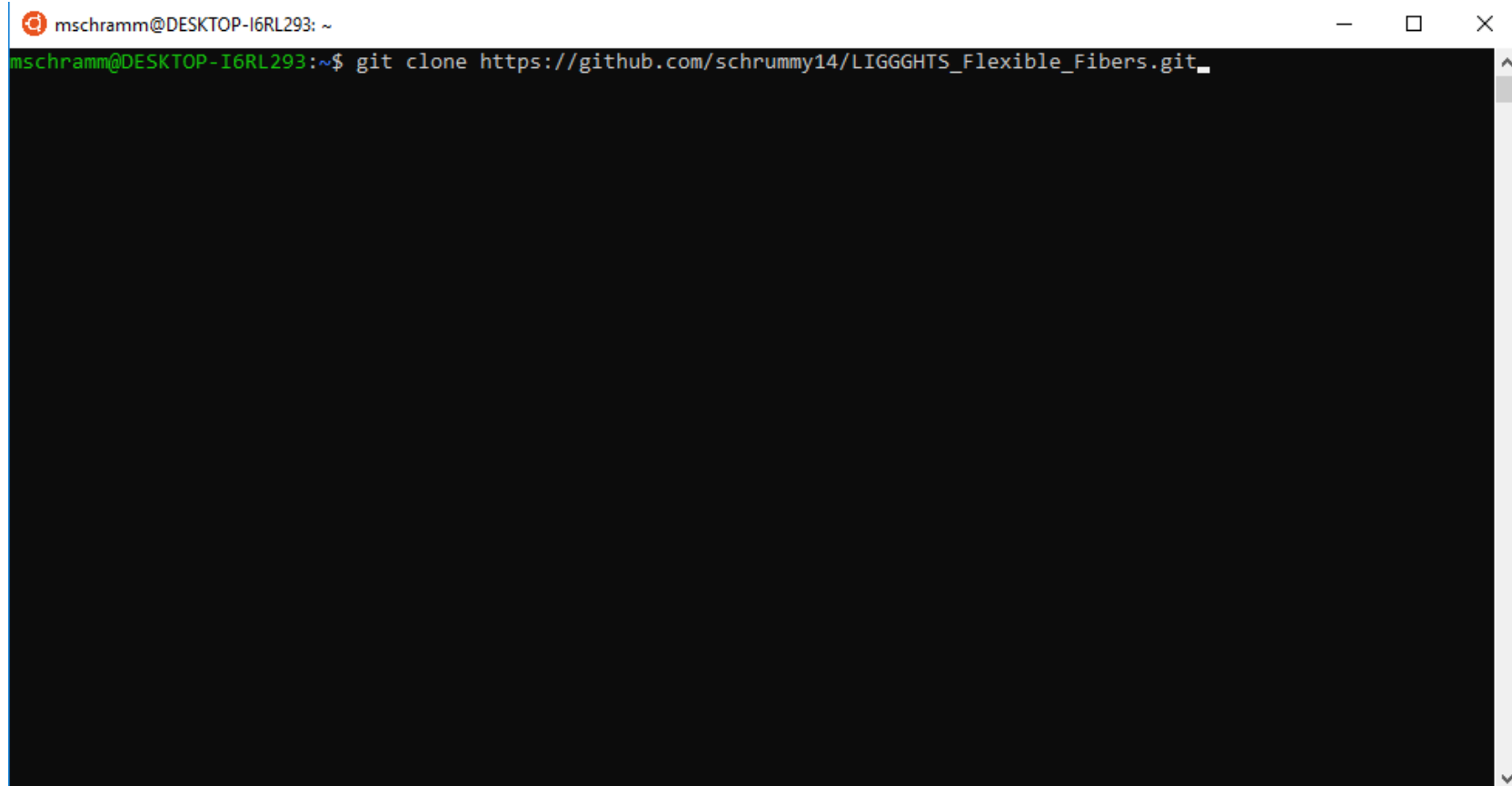
A screenshot of a Windows terminal window with a black background and white text. The window title bar at the top shows 'mschramm@DESKTOP-I6RL293: ~' and standard window control buttons (minimize, maximize, close). The terminal displays the command 'mschramm@DESKTOP-I6RL293:~\$ sudo apt install openmpi-bin libopenmpi-dev libvtk7.1 libvtk7-dev zip' in green text. The rest of the terminal area is empty, indicating the command has been entered but not yet executed or the output is not visible.

```
mschramm@DESKTOP-I6RL293: ~  
mschramm@DESKTOP-I6RL293:~$ sudo apt install openmpi-bin libopenmpi-dev libvtk7.1 libvtk7-dev zip
```

Install LIGGGHTS – Step 1

- Get LIGGGHTS using git

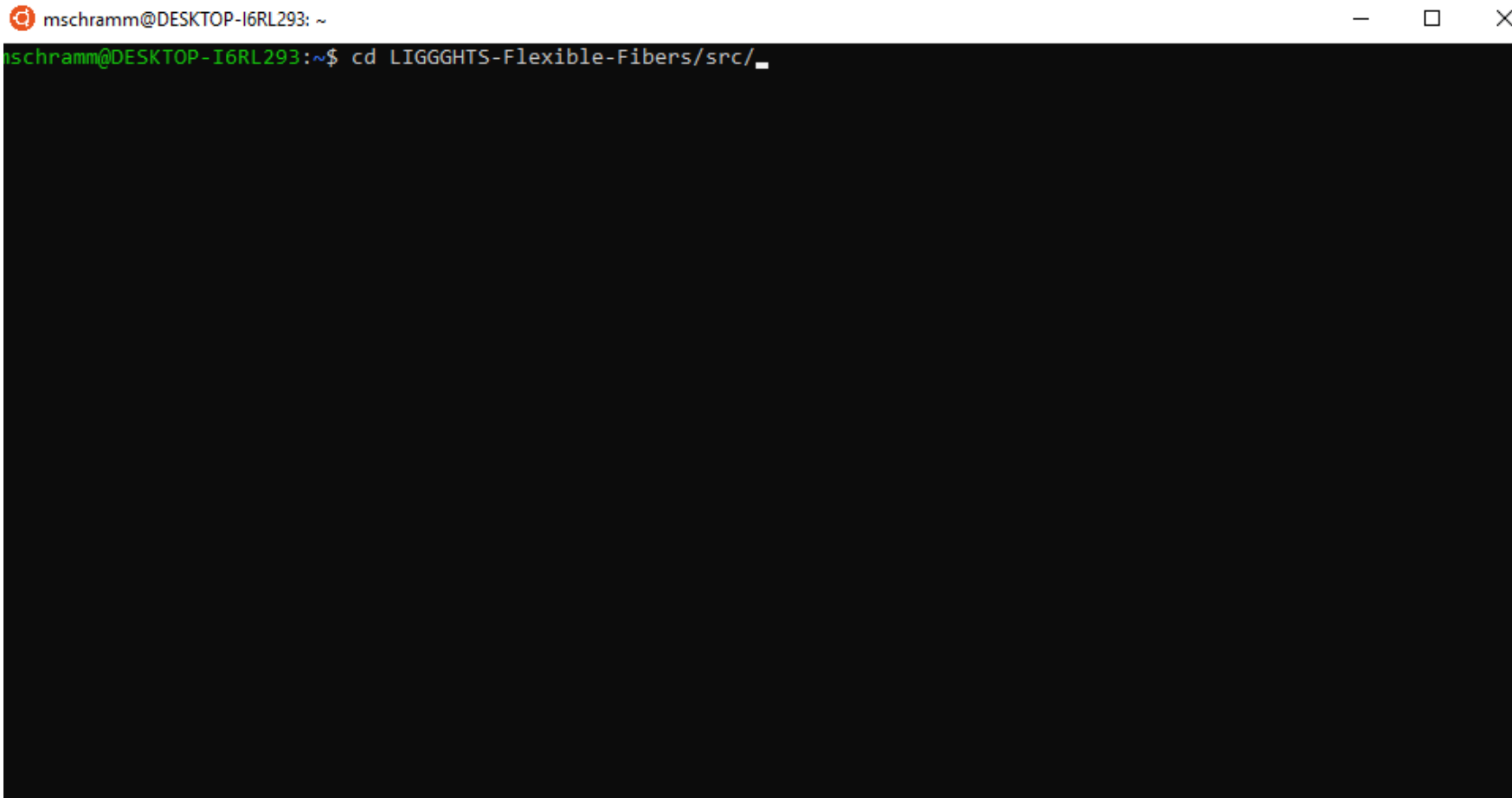
`git clone https://github.com/schrummy14/LIGGGHTS_Flexible_Fibers.git`

A screenshot of a terminal window with a black background and white text. The window title bar shows a red icon, the text 'mschramm@DESKTOP-I6RL293: ~', and standard window controls (minimize, maximize, close). The terminal content shows the prompt 'mschramm@DESKTOP-I6RL293:~\$' followed by the command 'git clone https://github.com/schrummy14/LIGGGHTS_Flexible_Fibers.git_'. The cursor is at the end of the command line.

```
mschramm@DESKTOP-I6RL293: ~  
mschramm@DESKTOP-I6RL293:~$ git clone https://github.com/schrummy14/LIGGGHTS_Flexible_Fibers.git_
```

Install LIGGGHTS – Step 2

- Navigate to src in LIGGGHTS “cd LIGGGHTS-Flexible-Fibers/src/”

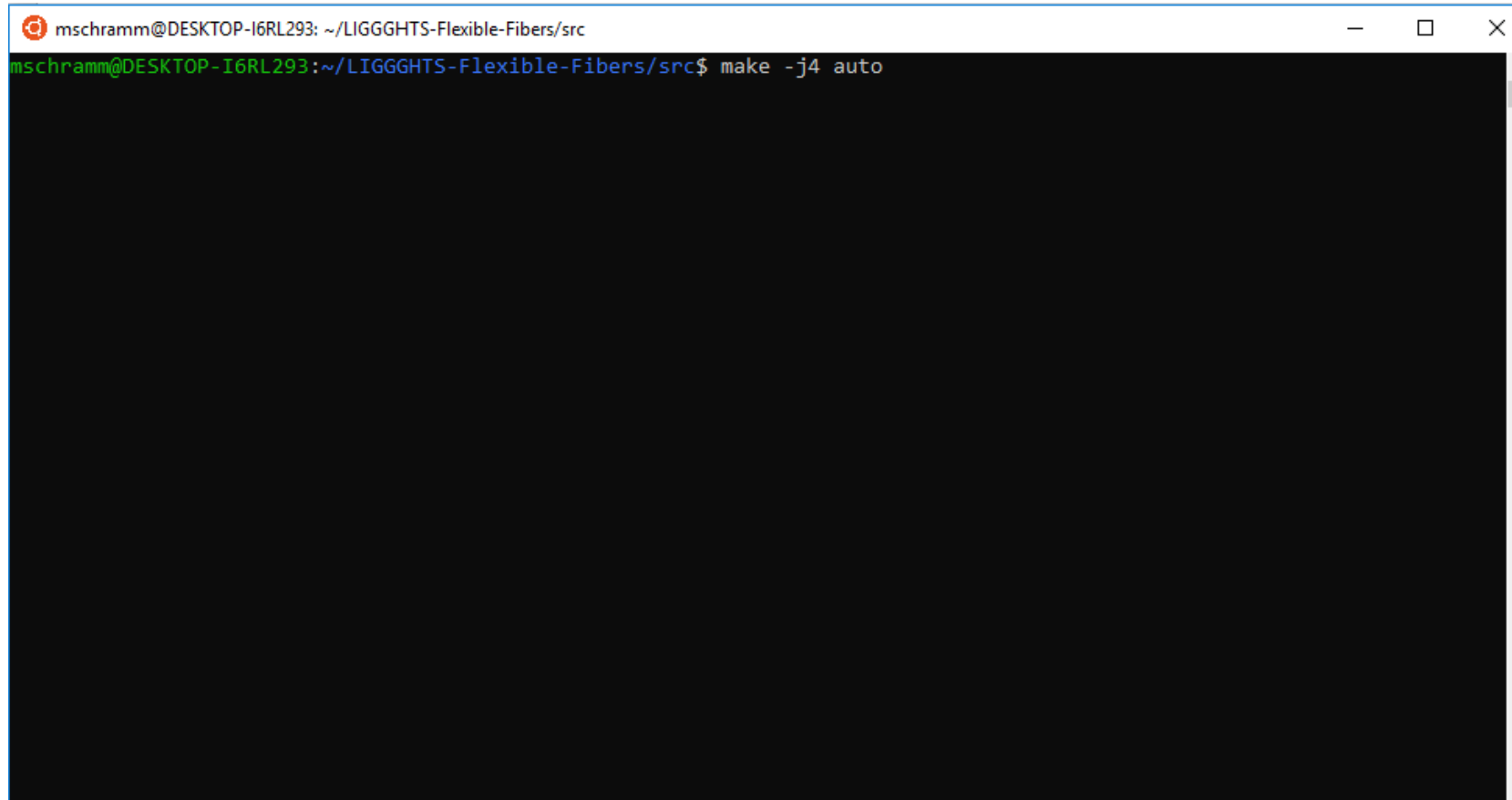


A terminal window with a black background and green text. The window title bar shows 'mschramm@DESKTOP-I6RL293: ~' and standard window controls. The command prompt shows 'mschramm@DESKTOP-I6RL293:~\$' followed by the command 'cd LIGGGHTS-Flexible-Fibers/src/' and a cursor.

```
mschramm@DESKTOP-I6RL293: ~  
mschramm@DESKTOP-I6RL293:~$ cd LIGGGHTS-Flexible-Fibers/src/
```

Install LIGGGHTS – Step 3

- Build LIGGGHTS “make -jm auto” where m is the number of cores on your machine



```
mschramm@DESKTOP-I6RL293: ~/LIGGGHTS-Flexible-Fibers/src
mschramm@DESKTOP-I6RL293:~/LIGGGHTS-Flexible-Fibers/src$ make -j4 auto
```

Install LIGGGHTS – Step 4

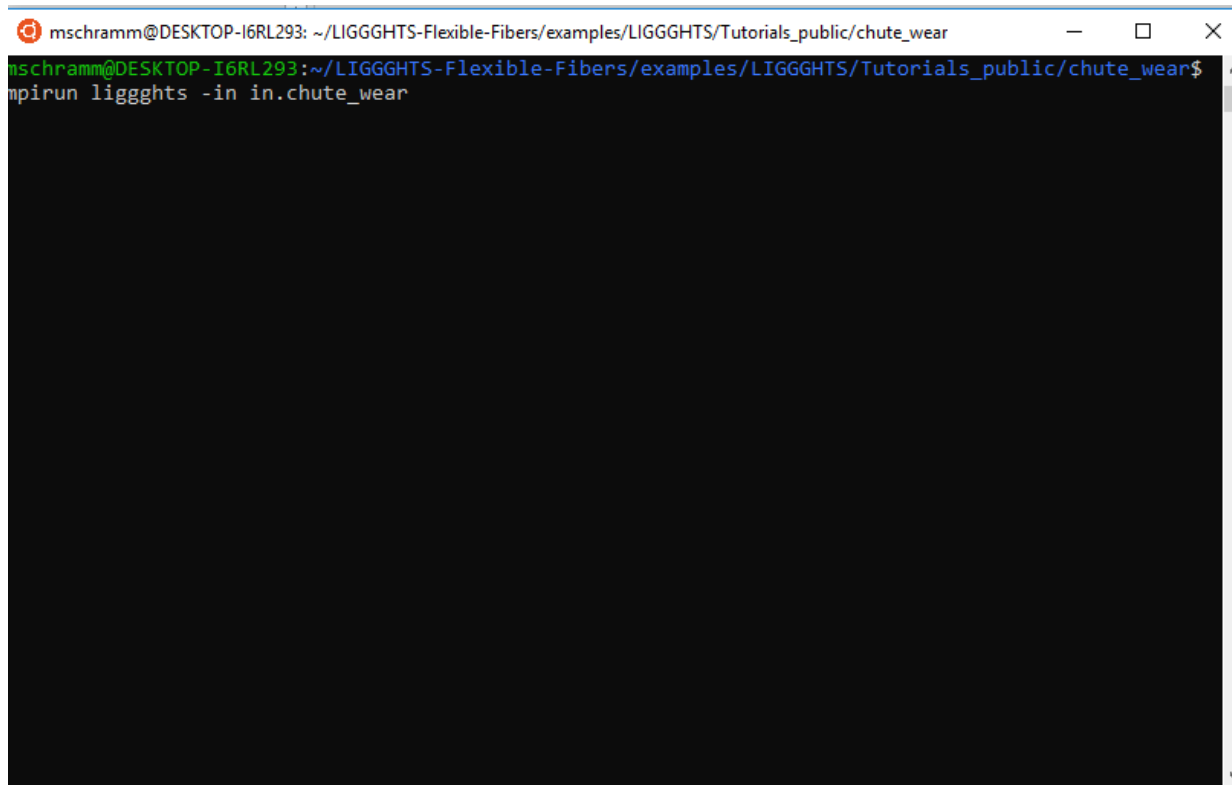
- Create a symbolic link for liggghts “sudo ln -s ~/LIGGGHTS-Flexible-Fibers/src/lmp_auto /usr/local/bin/liggghts”



```
mschramm@DESKTOP-I6RL293: ~/LIGGGHTS-Flexible-Fibers/src
mschramm@DESKTOP-I6RL293:~/LIGGGHTS-Flexible-Fibers/src$ sudo ln -s ~/LIGGGHTS-Flexible-Fibers/src/lmp_auto /usr/local/bin/liggghts
[sudo] password for mschramm:
mschramm@DESKTOP-I6RL293:~/LIGGGHTS-Flexible-Fibers/src$
```


Install LIGGGHTS – Step 5

- Check if install works by running an example
- Type “cd ../examples/LIGGGHTS/Tutorials_public/chute_wear”
- Run LIGGGHTS “mpirun liggghts -in in.chute”

A terminal window with a blue title bar. The title bar text is "mschramm@DESKTOP-I6RL293: ~/LIGGGHTS-Flexible-Fibers/examples/LIGGGHTS/Tutorials_public/chute_wear". The terminal content shows the prompt "mschramm@DESKTOP-I6RL293:~/LIGGGHTS-Flexible-Fibers/examples/LIGGGHTS/Tutorials_public/chute_wear\$" followed by the command "mpirun liggghts -in in.chute_wear". The rest of the terminal area is black.

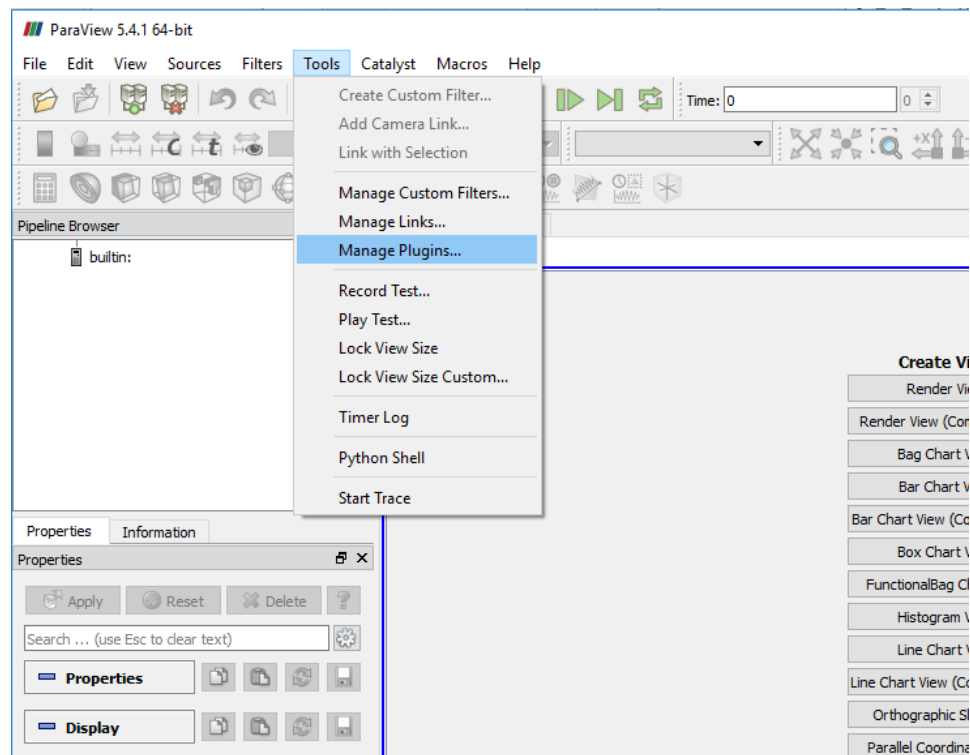
```
mschramm@DESKTOP-I6RL293: ~/LIGGGHTS-Flexible-Fibers/examples/LIGGGHTS/Tutorials_public/chute_wear
mschramm@DESKTOP-I6RL293:~/LIGGGHTS-Flexible-Fibers/examples/LIGGGHTS/Tutorials_public/chute_wear$
mpirun liggghts -in in.chute_wear
```

Install Paraview 5.4.1 – Step 1

- Download Paraview 5.4.1
<https://www.paraview.org/paraview-downloads/download.php?submit=Download&version=v5.4&type=binary&os=Windows&downloadFile=ParaView-5.4.1-Qt5-OpenGL2-Windows-64bit.exe>
- Run the installer

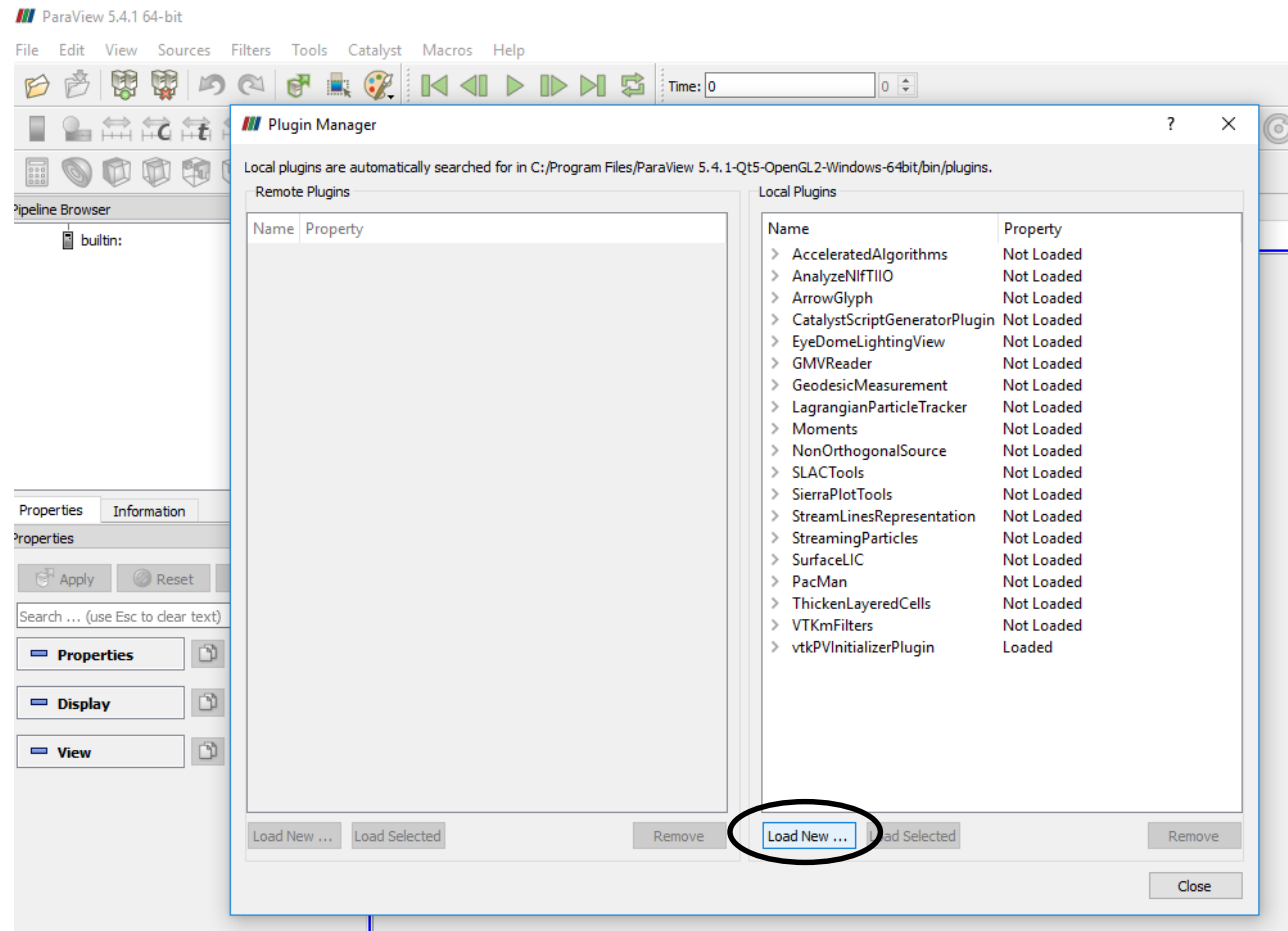
Install Paraview 5.4.1 – Step 2

- Download LIGGGHTS Reader
https://github.com/richti83/ParaView_Reader_for_LIGGGHTS/raw/master/pre_compiled/Windows/5.4.1/liggghts_reader.dll
- Start Paraview and navigate to manage plugins



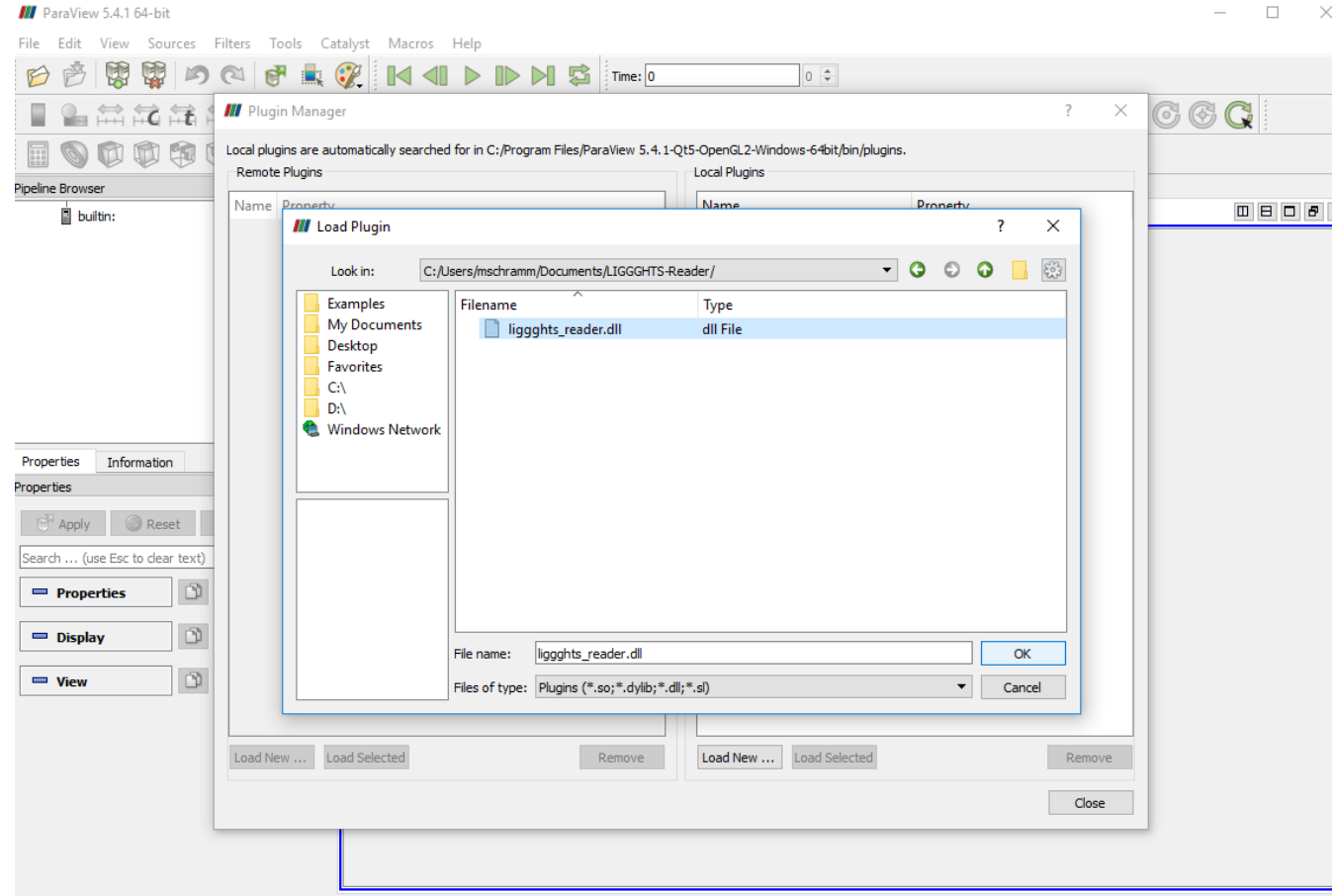
Install Paraview 5.4.1 – Step 3

- Load a new plugin



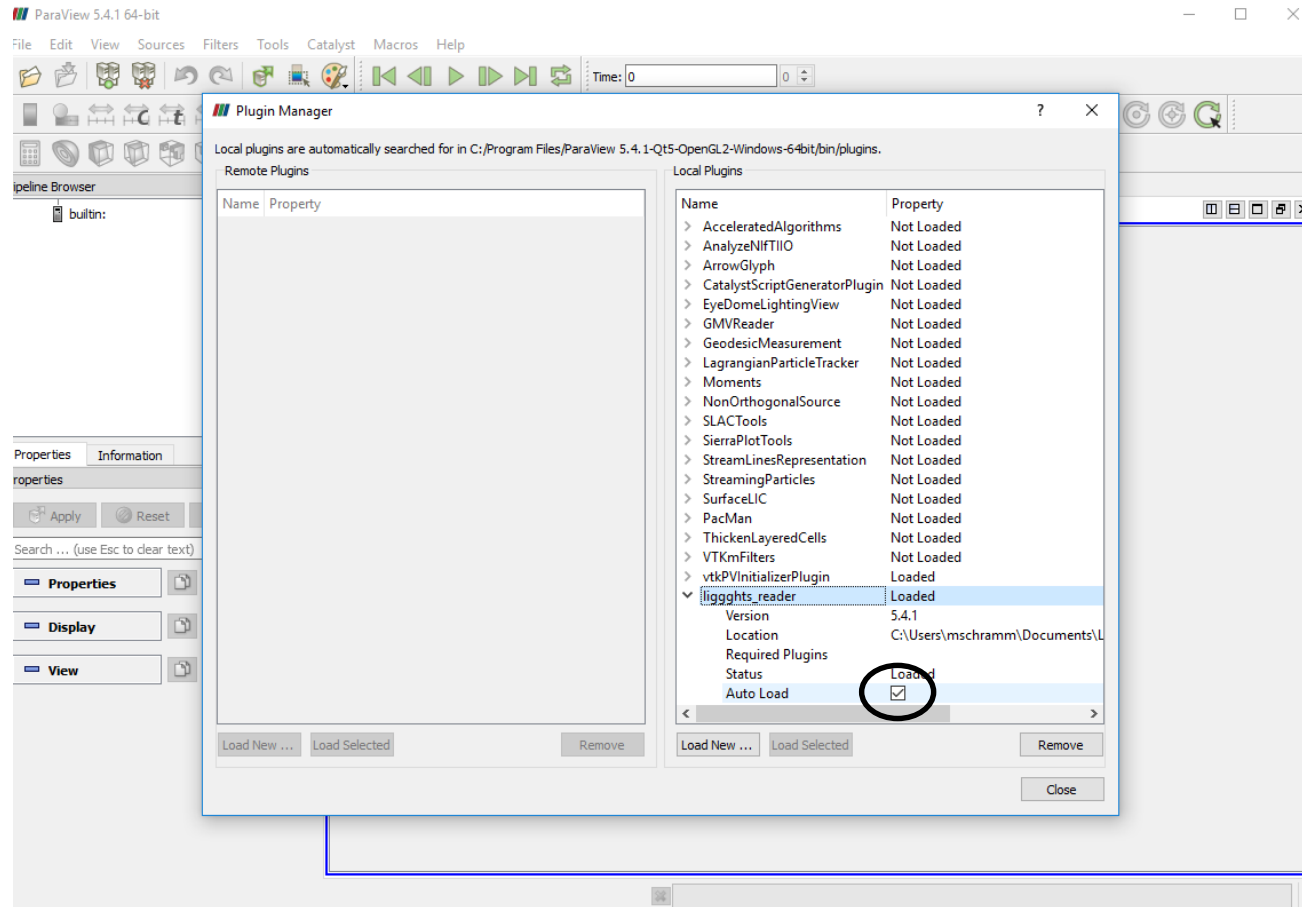
Install Paraview 5.4.1 – Step 4

- Add LIGGGHTS-Reader



Install Paraview 5.4.1 – Step 5

- Auto load the reader



Add Shortcut to the Linux sub system

- Navigate to
“C:\Users\<USER_NAME>\AppData\Local\Packages\CanonicalGroupLimited.Ubuntu18.04onWindows_79rhkp1fndgsc\LocalState\rootfs\home”
- Create a shortcut
- Move shortcut to desktop

