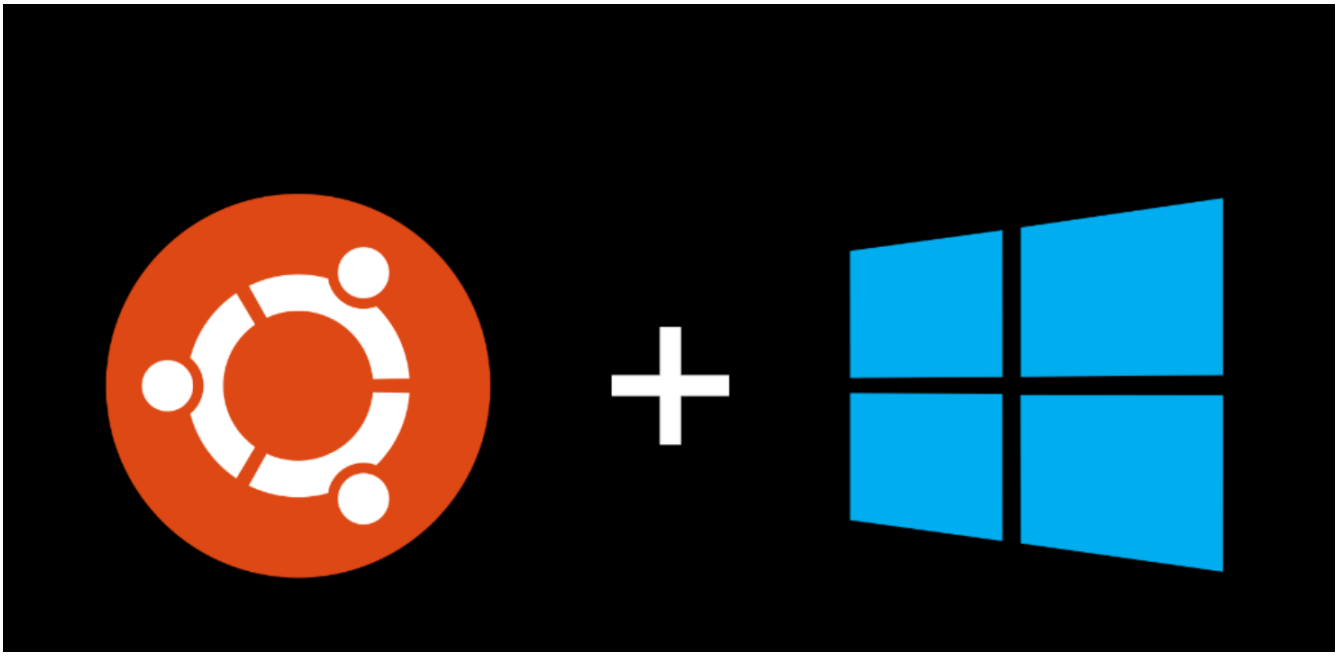
Windows Subsystem for Linux (WSL) Install and Customize Guide

Table of Contents



Windows 10 can run an instance of Ubuntu 18.04 using the Windows Subsystem for Linux WSL. The Ubuntu instance is limited to a command line instance but, it can run most Ubuntu server packages including Apache, MySQL and Mongo. This is a very convenient way to run Ubuntu Linux instance with using any Virtual Machine.

1. Introduction

Windows Subsystem for Linux gives Windows users the ability to run a Linux instance on top of the Windows instance. It does have some limitations but this guide are my notes for install and customization.

To download a PDF version of this document click on this link

2. Getting Started

The interface to Windows Subsystem for Linus (WSL) in the Terminal window. This means there are some basic commands and utilities you need to use and customize it.

2.1. Installation

Ubuntu 18.04 can be installed on Windows 10 from the Microsoft Store. The Ubuntu terminal and command-line-prompt become the user interface.

During the installation you will need to pick a Ubuntu user ID and password. Do I need to mention, not to forget them?

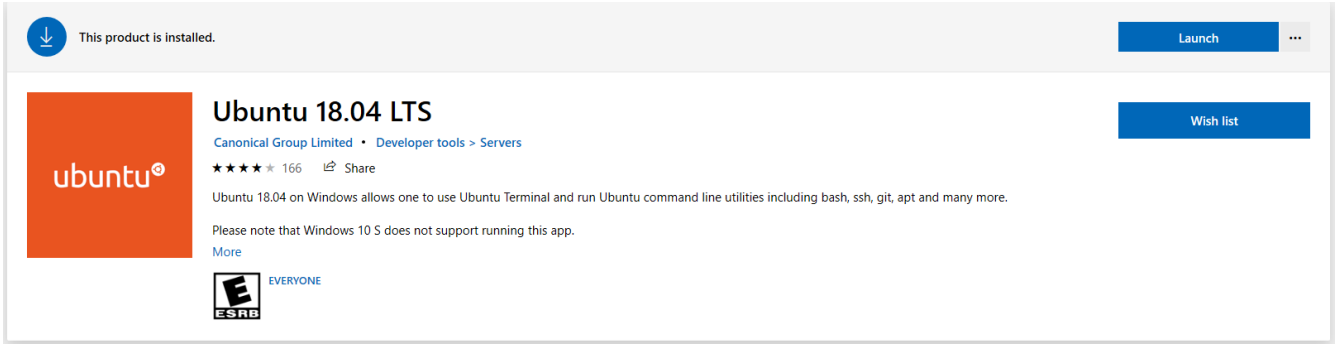


Figure 1. Ubuntu on Microsoft Store

To start Ubuntu, use `ubuntu1804` on the command-line prompt (cmd.exe), or click on the Ubuntu tile in the Start Menu.

The very first thing after the installation has completed is to is to `Update` the Ubuntu installation.

Update Command

```
jschust2@Adlantado:~$ sudo apt update
[sudo] password for jschust2:
Hit:1 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
.... on so on
Reading package lists... Done
Building dependency tree
Reading state information... Done
122 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

The second thing you should do is to `Upgrade` the Ubuntu installation. Be prepared as this will take some time to complete.

About half way through the `upgrade` you will asked if you want have services automatically restarted, anwser `Yes`.

Upgrade

```
jschust2@Adlantado:~$ sudo apt upgrade
[sudo] password for jschust2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following NEW packages will be installed:
  dbus-x11 fontconfig-config fonts-dejavu-core libasyncns0 libdrm-amdgpu1 libdrm-
intel1 libdrm-nouveau2 libdrm-radeon1
  libflac8 libfontconfig1 libfontenc1 libgl1 libgl1-mesa-dri libgl1-mesa-glx libglapi-
mesa libglvnd0 libglx-mesa0
  libglx0 libice6 libllvm8 libogg0 libpciaccess0 libpulse0 libpulsedsp libsensors4
libsm6 libsndfile1 libvorbis0a
  libvorbisenc2 libx11-xcb1 libxaw7 libxcb-dri2-0 libxcb-dri3-0 libxcb-glx0 libxcb-
```

```
present0 libxcb-shape0 libxcb-sync1
  libxcomposite1 libxdamage1 libxfixes3 libxft2 libxi6 libxinerama1 libxmu6 libxpm4
libxrandr2 libxrender1
  libxshmfence1 libxt6 libxtst6 libxv1 libxxf86dga1 libxxf86vm1 pulseaudio-utils x11-
common x11-utils
The following packages will be upgraded:
  apport apt apt-utils base-files bash bind9-host bsdutils bzip2 cloud-init curl dbus
distro-info-data dmeventd
  dmsetup dnsutils dpkg e2fsprogs fdisk friendly-recovery gcc-8-base grep initramfs-
tools initramfs-tools-bin
  initramfs-tools-core iputils-ping iputils-tracepath landscape-common language-
selector-common libapt-inst2.0
  libapt-pkg5.0 libbind9-160 libblkid1 libbz2-1.0 libcom-err2 libcurl3-gnutls libcurl4
libdb5.3 libdbus-1-3
  libdevmapper-event1.02.1 libdevmapper1.02.1 libdns-export1100 libdns1100 libdrm-
common libdrm2 libelf1 libexpat1
  libext2fs2 libfdisk1 libgcc1 libglib2.0-0 libglib2.0-data libgnutls30 libirs160
libisc-export169 libisc169
  libisccc160 libisccfg160 libldap-2.4-2 libldap-common liblvm2app2.2 liblvm2cmd2.02
liblwres160 libmount1 libmspack0
  libnss-systemd libpam-systemd libprocps6 libpython3.6 libpython3.6-minimal
libpython3.6-stdlib libseccomp2
  libsmartcols1 libsqlite3-0 libss2 libssl1.1 libstdc++6 libsystemd0 libudev1 libuuid1
libxslt1.1 libzstd1 lvm2 mount
  netplan.io nplan open-vm-tools openssl patch procps python3-apport python3-
cryptography python3-distupgrade
  python3-gdbm python3-jinja2 python3-problem-report python3-software-properties
python3.6 python3.6-minimal snapd
  software-properties-common sosreport sudo systemd systemd-sysv tmux tzdata ubuntu-
minimal
  ubuntu-release-upgrader-core ubuntu-server ubuntu-standard ubuntu-wsl udev update-
notifier-common util-linux
  uuid-runtime vim vim-common vim-runtime vim-tiny wslu xkb-data xxd
122 upgraded, 56 newly installed, 0 to remove and 0 not upgraded.
Need to get 76.9 MB of archives.
After this operation, 230 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

3. File Explorer (Midnight Commander)

Because I don't like to type in Linux command to change directory or launch commands I reply on a File Explorer called Midmight Commander.

It is a dual pane file explorer with function key control over copy, editing and managing the Ubuntu files.

Midnight Commander Install

```
jschust2@Adlantado:~$ sudo apt install mc
[sudo] password for jschust2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libssh2-1 mc-data unzip
Suggested packages:
  arj catdvi | texlive-binaries dbview djvulibre-bin genisoimage gv imagemagick
libaspell-dev links | w3m | lynx
  odt2txt poppler-utils python python-boto python-tz xpdf | pdf-viewer zip
The following NEW packages will be installed:
  libssh2-1 mc mc-data unzip
0 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 1952 kB of archives.
After this operation, 8099 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

After the MC installation has completed, run it by typing `mc`.

The Midnight Commander user interface looks like

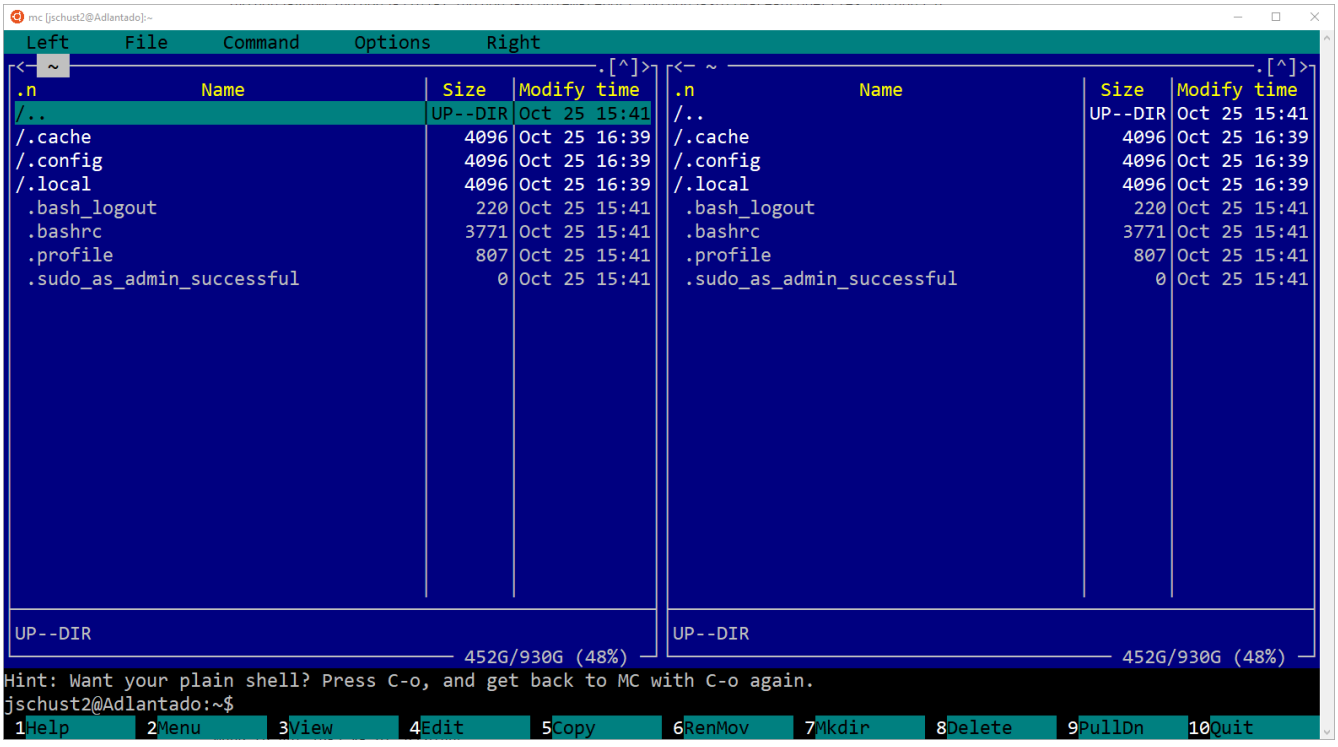


Figure 2. Midnight Command UI

The first time you use the editor I use the Nano editor.

4. Customize startup (.bashrc)

The `.bashrc` is the startup file for the Ubuntu command line environment environment. By making

some simple changed to this file you can make the interface much more efficient and cute.

Using MC `edit` the file `.bashrc`

Change the prompt to colored.

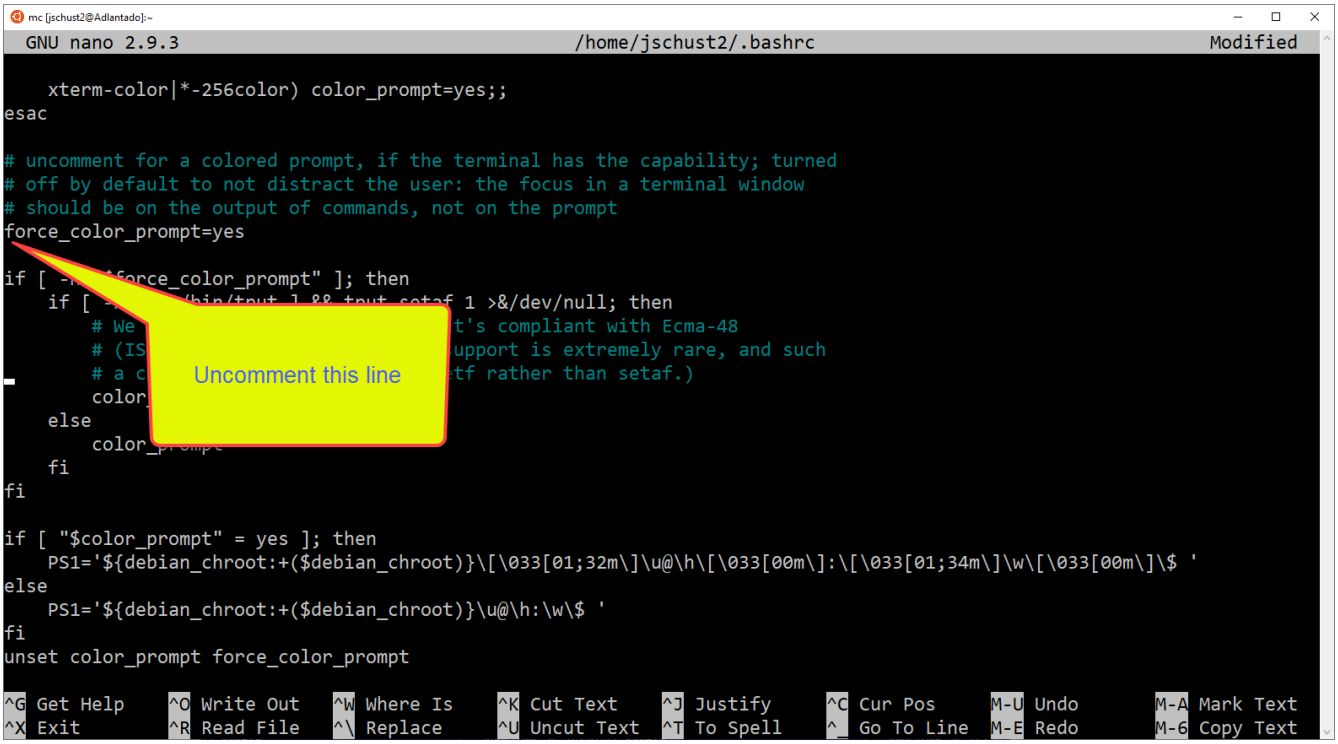


Figure 3. Force Color Prompt

Make the GCC error and warning display in color.

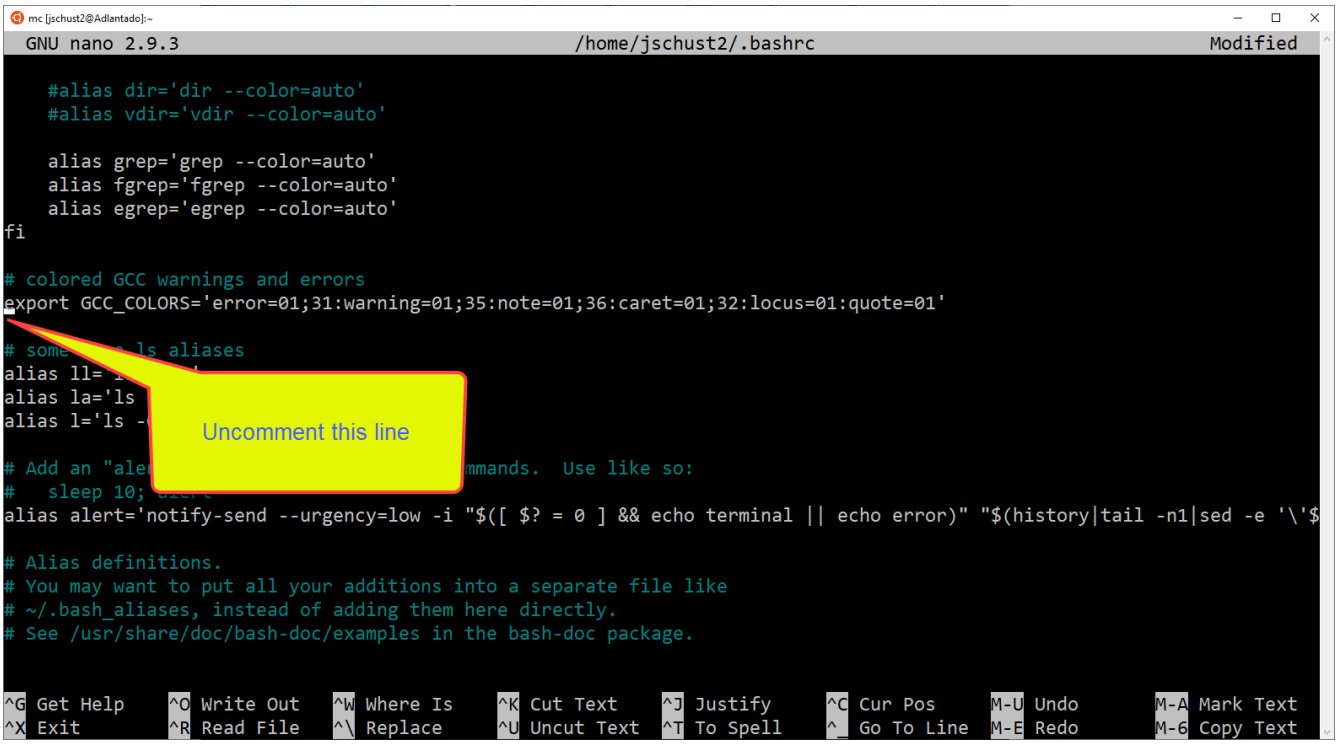


Figure 4. GCC Color

Then save the `.bashrc` file, `Ctrl-O`, `Enter` followed by `Ctrl-X`

5. Screen Fetch

When the Ubuntu environment starts up I like to see information about this instance of Ubuntu. Information like user name, Ubuntu version, type CPU and memeory.

The `screenfetch` command is good for this and needs to be installed.

Please download the latest script revision from Github. The version installed with `apt` is outdated.

The commands to do the Screenfetch install are

Screenfetch Commands

```
wget https://raw.githubusercontent.com/KittyKatt/screenFetch/master/screenfetch-dev ①
chmod +x screenfetch-dev ②
sudo mv screenfetch-dev /usr/bin/screenfetch ③
```

① Download the correct Screenfetch from GiyHub

② Make that new file executable

③ Move and rename the new command to the system command folder `/usr/bin`

Screenfetch install

```
jschust2@Adlantado:~$ wget
https://raw.githubusercontent.com/KittyKatt/screenFetch/master/screenfetch-dev
Will not apply HSTS. The HSTS database must be a regular and non-world-writable file.
ERROR: could not open HSTS store at '/home/jschust2/.wget-hsts'. HSTS will be
disabled.
--2019-10-25 18:48:38--
https://raw.githubusercontent.com/KittyKatt/screenFetch/master/screenfetch-dev
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 151.101.0.133,
151.101.64.133, 151.101.128.133, ...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com
)|151.101.0.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 244084 (238K) [text/plain]
Saving to: ‘screenfetch-dev.1’

screenfetch-dev.1             100%[=============================================>]
238.36K  --.-KB/s    in 0.07s

2019-10-25 18:48:38 (3.12 MB/s) - ‘screenfetch-dev.1’ saved [244084/244084]

jschust2@Adlantado:~$ chmod +x screenfetch-dev
jschust2@Adlantado:~$ sudo mv screenfetch-dev /usr/bin/screenfetch
[sudo] password for jschust2:
jschust2@Adlantado:~$
```

To test the new `screenfetch` command

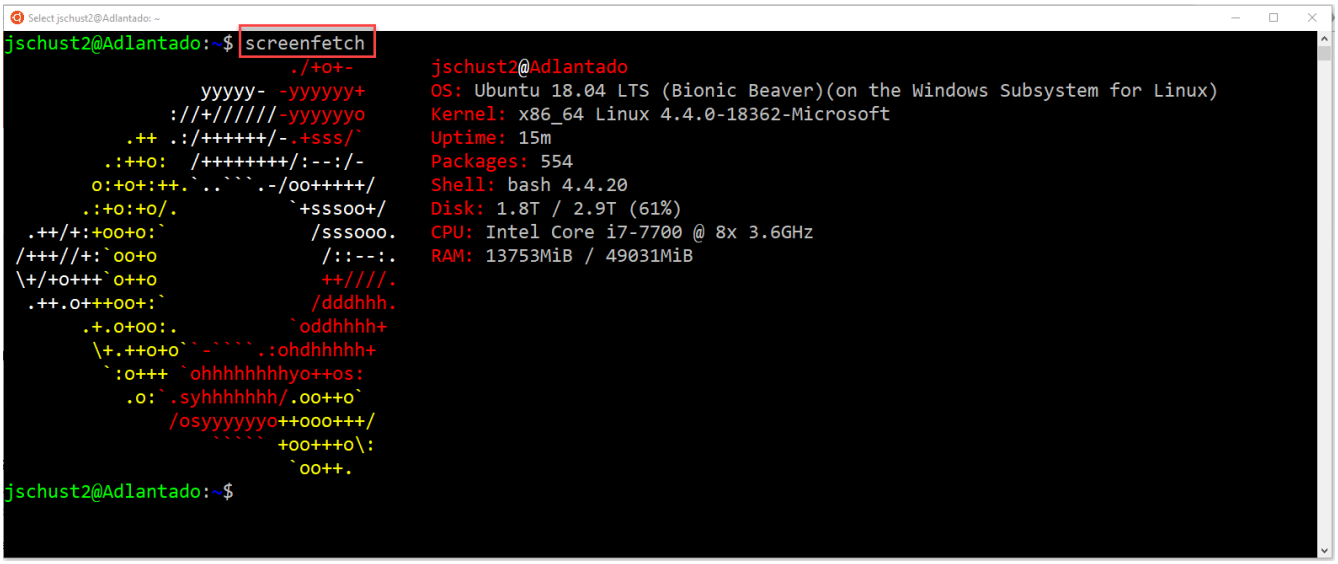


Figure 5. Screenfetch Example

Add this new command to the `.bashrc` file by opening it and adding the command and saving the file.

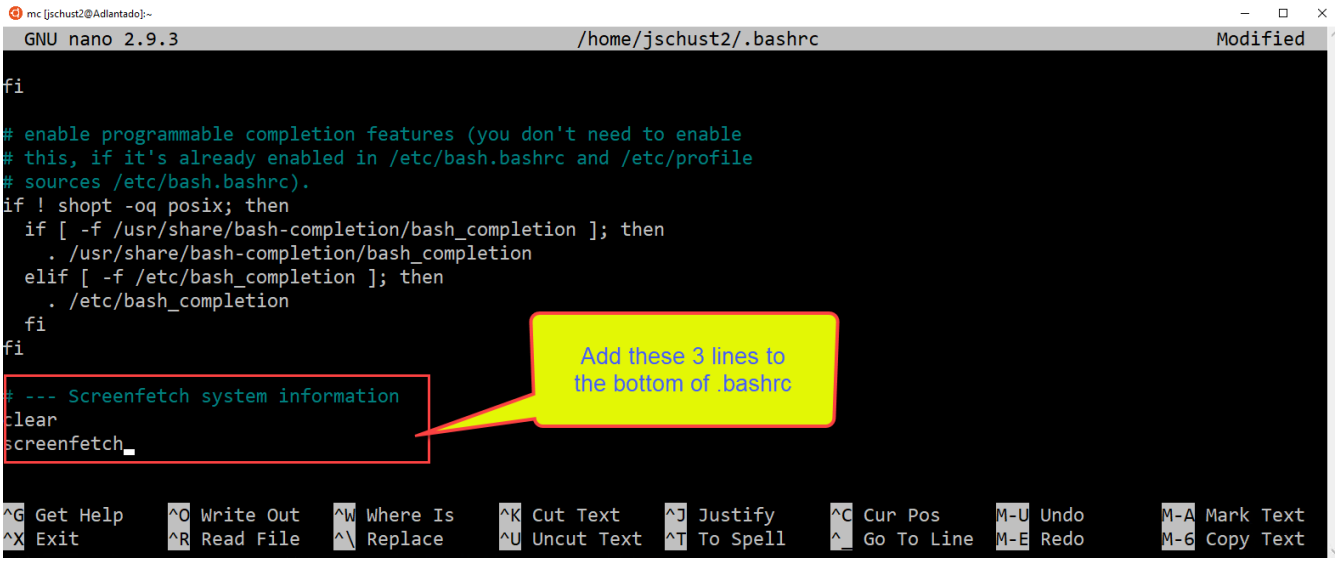


Figure 6. Edit .bashrc

To verify that the new `screenfetch` and the `.bashrc` have worked enter

```
exec bash
```

6. Figlet (Banners)

I enjoy making the shell scripts I write just a little more visually entertaining by using banners. The `figlet` command is a good utility for banners.

Figlet installation

```
jschust2@Adlantado:~/new-project$ sudo apt install figlet
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme at-spi2-core dconf-gsettings-backend dconf-service fontconfig
  glib-networking glib-networking-common glib-networking-services
  gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme
  humanity-icon-theme libatk-bridge2.0-0 libatk1.0-0 libatk1.0-data libatspi2.0-0
  libavahi-client3 libavahi-common-data libavahi-common3 libcairo-gobject2 libcairo2
  libcolord2 libcroco3 libcups2 libdatrie1 libdconf1 libepoxy0 libgail-common
libgail18
  libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libgraphite2-3
  libgtk-3-0 libgtk-3-bin libgtk-3-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common
  libharfbuzz0b libjson-glib-1.0-0 libjson-glib-1.0-common liblcms2-2 libnotify4
  libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0 libpixman-1-0 libproxy1v5
  librest-0.7-0 librsvg2-2 librsvg2-common libsoup-gnome2.4-1 libsoup2.4-1 libthai-
data
  libthai0 libwayland-client0 libwayland-cursor0 libwayland-egl1 libwxbase3.0-0v5
  libwxgtk3.0-0v5 libxcb-render0 libxcb-shm0 libxcursor1 libxkbcommon0
  notification-daemon ubuntu-mono
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  figlet
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 133 kB of archives.
After this operation, 752 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/universe amd64 figlet amd64 2.2.5-3 [133
kB]
Fetched 133 kB in 1s (198 kB/s)
Selecting previously unselected package figlet.
(Reading database ... 51324 files and directories currently installed.)
Preparing to unpack .../figlet_2.2.5-3_amd64.deb ...
Unpacking figlet (2.2.5-3) ...
Setting up figlet (2.2.5-3) ...
update-alternatives: using /usr/bin/figlet-figlet to provide /usr/bin/figlet (figlet)
in auto mode
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
jschust2@Adlantado:~/new-project$
```

To create banner use the example below as a reference.

There are many different options and fonts available under the `Figlet` command.

Figlet example

```
jschust2@Adlantado:~/new-project$ figlet "Gen-Doco"
  ____                  ____
 / ___| ___ _ __       |  _ \  ___   ___ ___
| |  _ / _ \ '_ \ _____| | | |/ _ \ / __/ _ \
| |_| |  __/ | | |_____| |_| | (_) | (_| (_) |
 \____|\___|_| |_|     |____/ \___/ \___\___/

jschust2@Adlantado:~/new-project$
```

7. Dialog (Menus)

Because this Ubuntu instance is command line only it would be nice to have a mneu system that looks almost like a GUI.

The utility for this is called `dialog` and is used in bash shell scripts to help make great looking menus.

The menu below was generated from the `tmenu.sh` shell script.

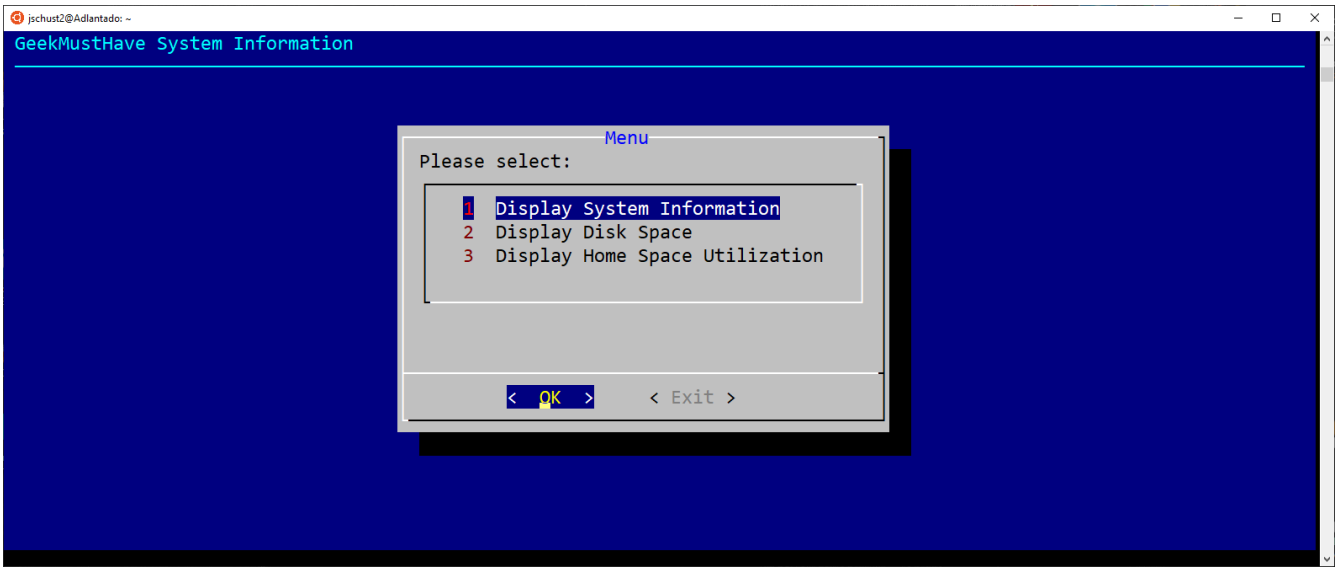


Figure 7. Dialog GUI Example

Dialog Installation

```
jschust2@Adlantado:~$ sudo apt install dialog
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  dialog
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 217 kB of archives.
After this operation, 1149 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/universe amd64 dialog amd64 1.3-
20171209-1 [217 kB]
Fetched 217 kB in 1s (256 kB/s)
Selecting previously unselected package dialog.
(Reading database ... 29678 files and directories currently installed.)
Preparing to unpack .../dialog_1.3-20171209-1_amd64.deb ...
Unpacking dialog (1.3-20171209-1) ...
Setting up dialog (1.3-20171209-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
jschust2@Adlantado:~$
```

To verify that `dialog` has been installed type

```
dialog
```

A few pages of Dialog aoptions will be displayed. This document is not meant to be a tutorial on how to create Dialog menus so an example may be the best instruction.

The following `tmenu.sh` bash script uses the dialog commands to build a simple menu seen in the snapshot above. This is just a short example of some of the powerful commands in the `dialog` utility.

Create a new file named `tmenu.sh` and copy the following text into it.

tmenu.sh Dialog script

```
#!/bin/bash

# while-menu-dialog: a menu driven system information program

DIALOG_CANCEL=1
DIALOG_ESC=255
HEIGHT=0
WIDTH=0

display_result() {
  dialog --title "$1" \
    --no-collapse \
    --msgbox "$result" 0 0
```

```
}

while true; do
  exec 3>&1
  selection=$(dialog \
    --backtitle "GeekMustHave System Information" \
    --title "Menu" \
    --clear \
    --cancel-label "Exit" \
    --menu "Please select:" $HEIGHT $WIDTH 4 \
    "1" "Display System Information" \
    "2" "Display Disk Space" \
    "3" "Display Home Space Utilization" \
    2>&1 1>&3)
  exit_status=$?
  exec 3>&-
  case $exit_status in
    $DIALOG_CANCEL)
      clear
      echo "Program terminated."
      exit
      ;;
    $DIALOG_ESC)
      clear
      echo "Program aborted." >&2
      exit 1
      ;;
  esac
  case $selection in
    0 )
      clear
      echo "Program terminated."
      ;;
    1 )
      result=$(echo "Hostname: $HOSTNAME"; uptime)
      display_result "System Information"
      ;;
    2 )
      result=$(df -h)
      display_result "Disk Space"
      ;;
    3 )
      if [[ $(id -u) -eq 0 ]]; then
        result=$(du -sh /home/* 2> /dev/null)
        display_result "Home Space Utilization (All Users)"
      else
        result=$(du -sh $HOME 2> /dev/null)
        display_result "Home Space Utilization ($USER)"
      fi
      ;;
  esac
```

```
done
```

To download the `tmenu.sh` click on this link

After the file has been created it must be make executagle with the command

```
chmod +x tmenu.sh
```

Then to run the Bash shell script use the command

```
./tmenu.sh
```

8. Alias

An alias is custom command that you define in Ubuntu.

The Dialog example above is only available from the `home` directory and it's name `tmenu.sh` is unclear. It would be better if this Dialog shell script could be executed from anywhere using `menu`.

Open the `.bashrc` file and edit it. Add the following lines at the end of the file.

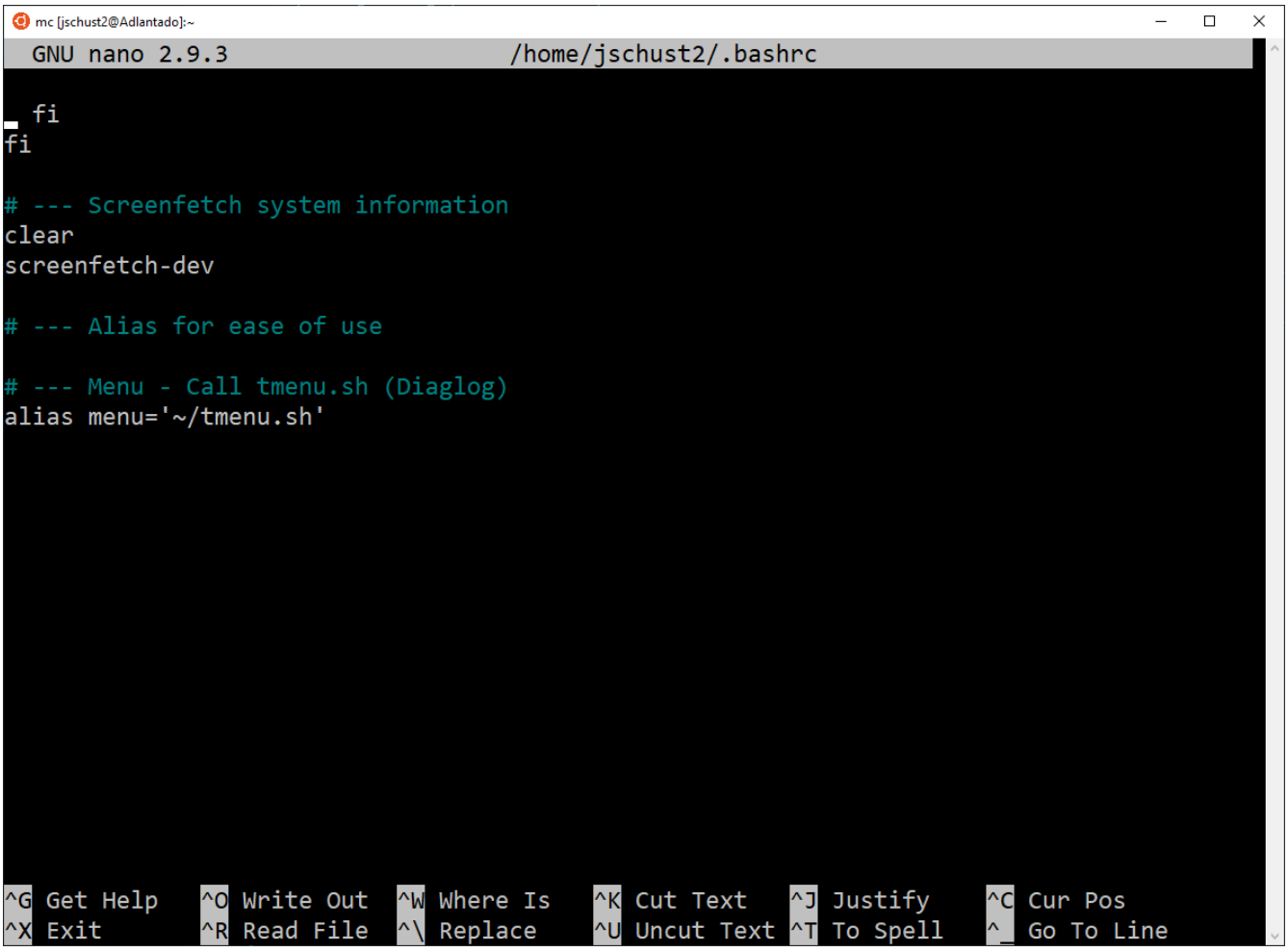


Figure 8. Alias for tmenu.sh

Save the file and restart the bash environment by entering the following command.

```
exec bash
```

Then the `tmenu.sh` can be run from any directory by entering `menu` .

9. ASCIIdoctor

ASCIIDcotor is a tool chain when used with an text editor can create very well formatted documentation that can be used in a web page or generated into a PDF.

This entire installation guide was written with ASCIIDoctor formatted text file.

To download the `readme.adoc` file, for this document, use the following link

The installation of `ASCIIDoctor` will include the installation of Ruby and GEM the Ruby package manager. `ASCIIDoctor` produces a HTML formatted file that can be viewed in a browser or copied to a web server.

ASCIIDoctor installation

```
jschust2@Adlantado:~$ sudo apt install asciidoctor
[sudo] password for jschust2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  fonts-lato javascript-common libjs-jquery libruby2.5 rake ruby ruby-did-you-mean
ruby-minitest ruby-net-telnet
  ruby-power-assert ruby-test-unit ruby2.5 rubygems-integration zip
Suggested packages:
  apache2 | lighttpd | httpd ri ruby-dev bundler
The following NEW packages will be installed:
  asciidoctor fonts-lato javascript-common libjs-jquery libruby2.5 rake ruby ruby-did-
you-mean ruby-minitest
  ruby-net-telnet ruby-power-assert ruby-test-unit ruby2.5 rubygems-integration zip
0 upgraded, 15 newly installed, 0 to remove and 0 not upgraded.
Need to get 6493 kB of archives.
After this operation, 29.4 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

To verify `ASCIIDoctor` was installed use the following command

Test ASCIIDoctor

```
jschust2@Adlantado:~$ asciidoctor -v
Asciidoctor 1.5.5 [http://asciidoctor.org]
Runtime Environment (ruby 2.5.1p57 (2018-03-29 revision 63029) [x86_64-linux-gnu])
(lc:UTF-8 fs:UTF-8 in:- ex:UTF-8)
```

The installation of `ASCIIDoctor-PDF` will produces a PDF formatted file that can be distributed using email, document management or other transfer methods.

ASCIIDoctor-PDF

```
jschust2@Adlantado:~$ sudo gem install asciidoctor-pdf --pre
[sudo] password for jschust2:
TheriSorry, try again.
[sudo] password for jschust2:
Fetching: pdf-core-0.7.0.gem (100%)
Successfully installed pdf-core-0.7.0
Fetching: ttfunk-1.5.1.gem (100%)
Successfully installed ttfunk-1.5.1
.... tons more ...
Done installing documentation for pdf-core, ttfunk, prawn, prawn-table, Ascii85, ruby-
rc4, hashery, afm, pdf-reader, prawn-templates, public_suffix, addressable,
css_parser, prawn-svg, prawn-icon, safe_yaml, thread_safe, concurrent-ruby, polyglot,
treetop, asciidoctor-pdf after 38 seconds
21 gems installed
```

To verify that `ASCIIDoctor-PDF` installed use the following command.

Verify ASCIIDoctor-PDF

```
jschust2@Adlantado:~$ asciidoctor-pdf -v
Asciidoctor PDF 1.5.0.beta.6 using Asciidoctor 1.5.5 [http://asciidoctor.org]
Runtime Environment (ruby 2.5.1p57 (2018-03-29 revision 63029) [x86_64-linux-gnu])
(lc:UTF-8 fs:UTF-8 in:- ex:UTF-8)
```

9.1. Testing the ASCIIDoctor tool chain

This document was not meant to be a tutorial on how to create ASCIIDoctor files, so an example may be the best way of showing the process.

To test the ASCIIDoctor Toolchain there is a `sample.adoc` file with a small example of ADOC foramtted files

To download the `sample.adoc` file click on the following link link

Using the Nano text editor create a file called `sample.adoc` and paste the content of the file shown above into it and save the file.

ASCCIDoctor Toolchain

```
jschust2@Adlantado:~$ ls sample.*
sample.adoc
jschust2@Adlantado:~$ asciidoctor *.adoc
jschust2@Adlantado:~$ asciidoctor-pdf *.adoc
jschust2@Adlantado:~$ ls sample.*
sample.adoc  sample.html  sample.pdf
jschust2@Adlantado:~$
```

The HTML Generated file `sample,html` can be opened with a browser.

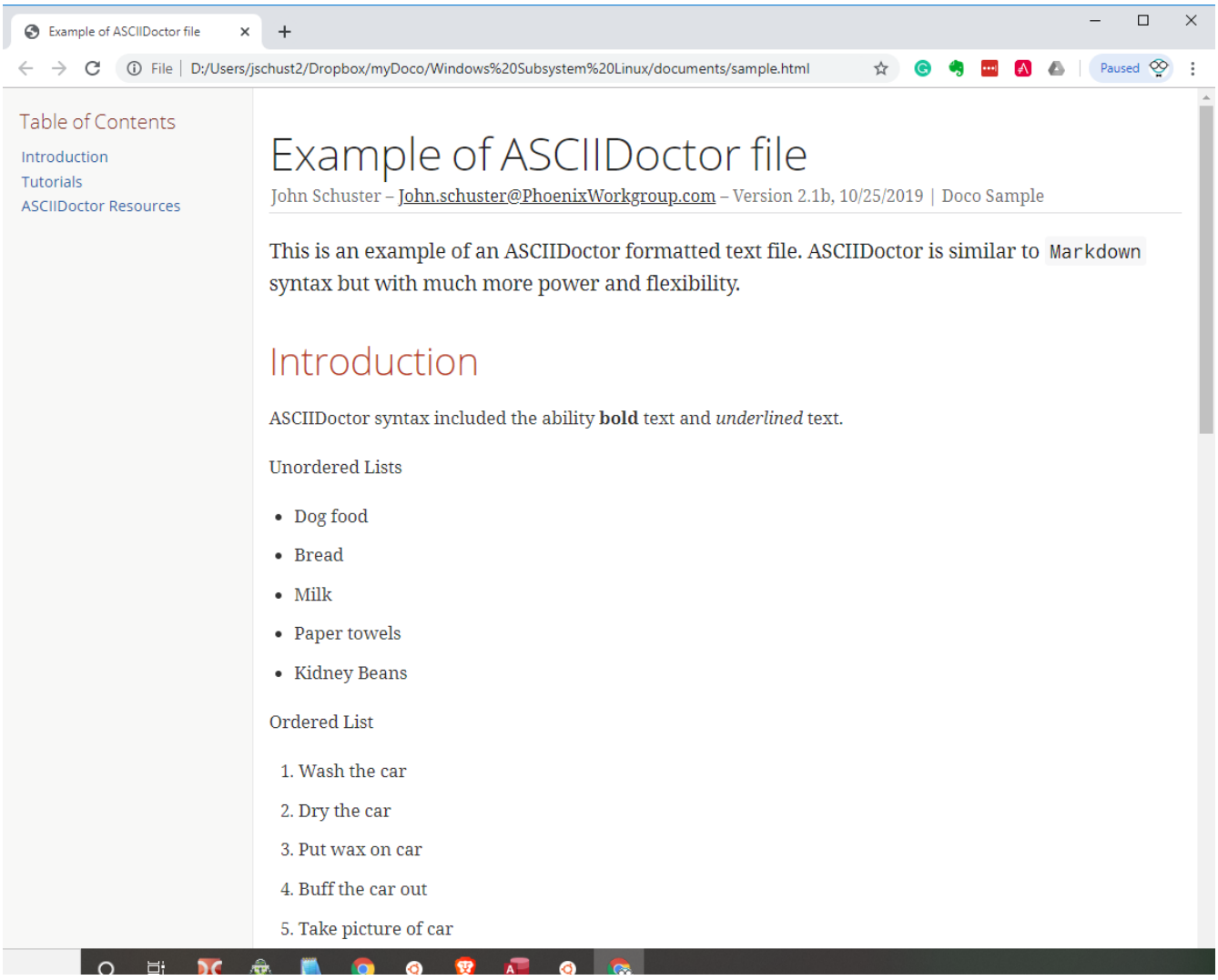


Figure 9. ASCIIDoctor HTML

The PDF generated file `sample.pdf` can be opened with a PDF Viewer or some browsers.

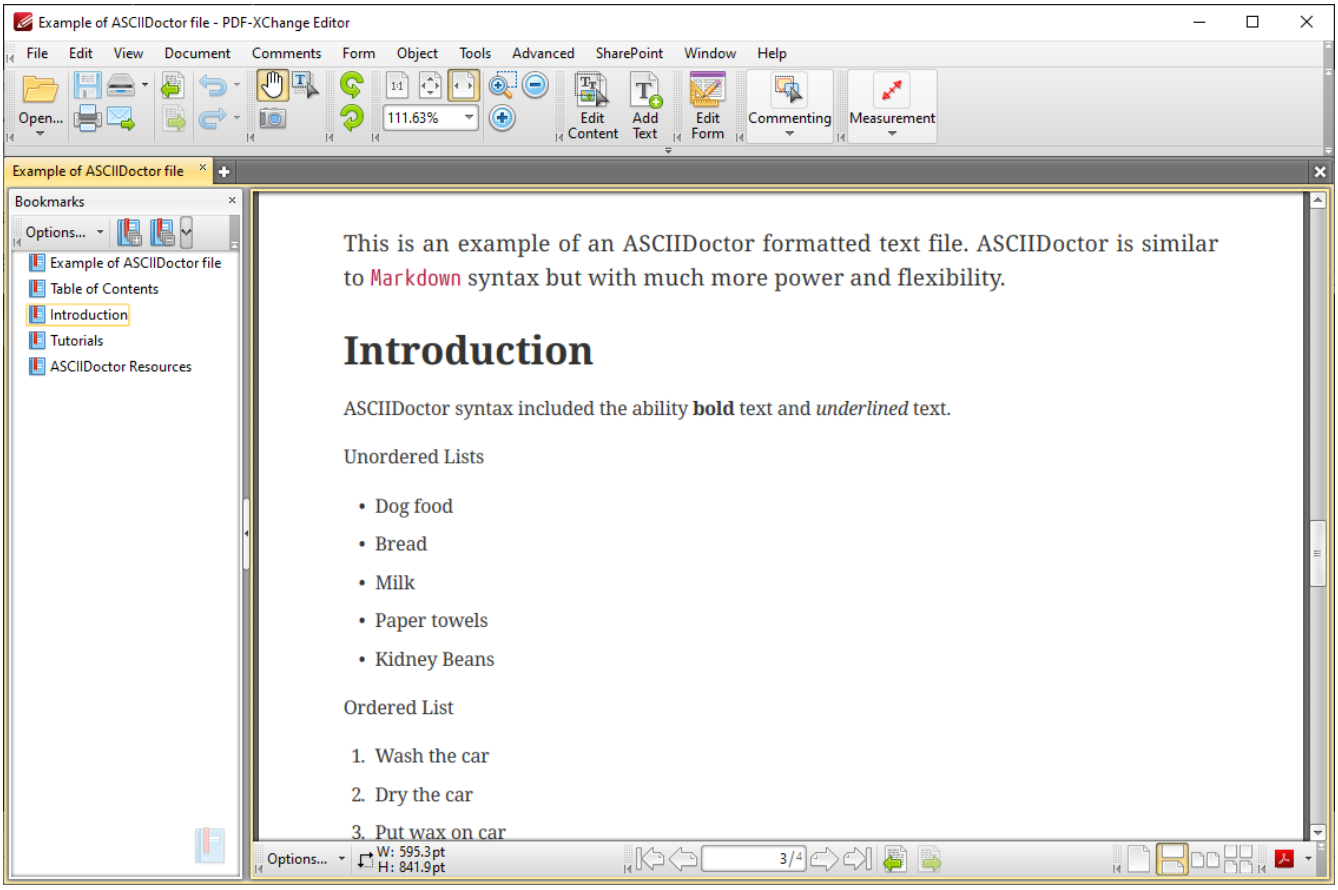


Figure 10. ASCIIDoctor PDF

10. Windows 10 Mounts - Ubuntu

All of the Windows Drives are automatically mounted when Ubuntu is started.

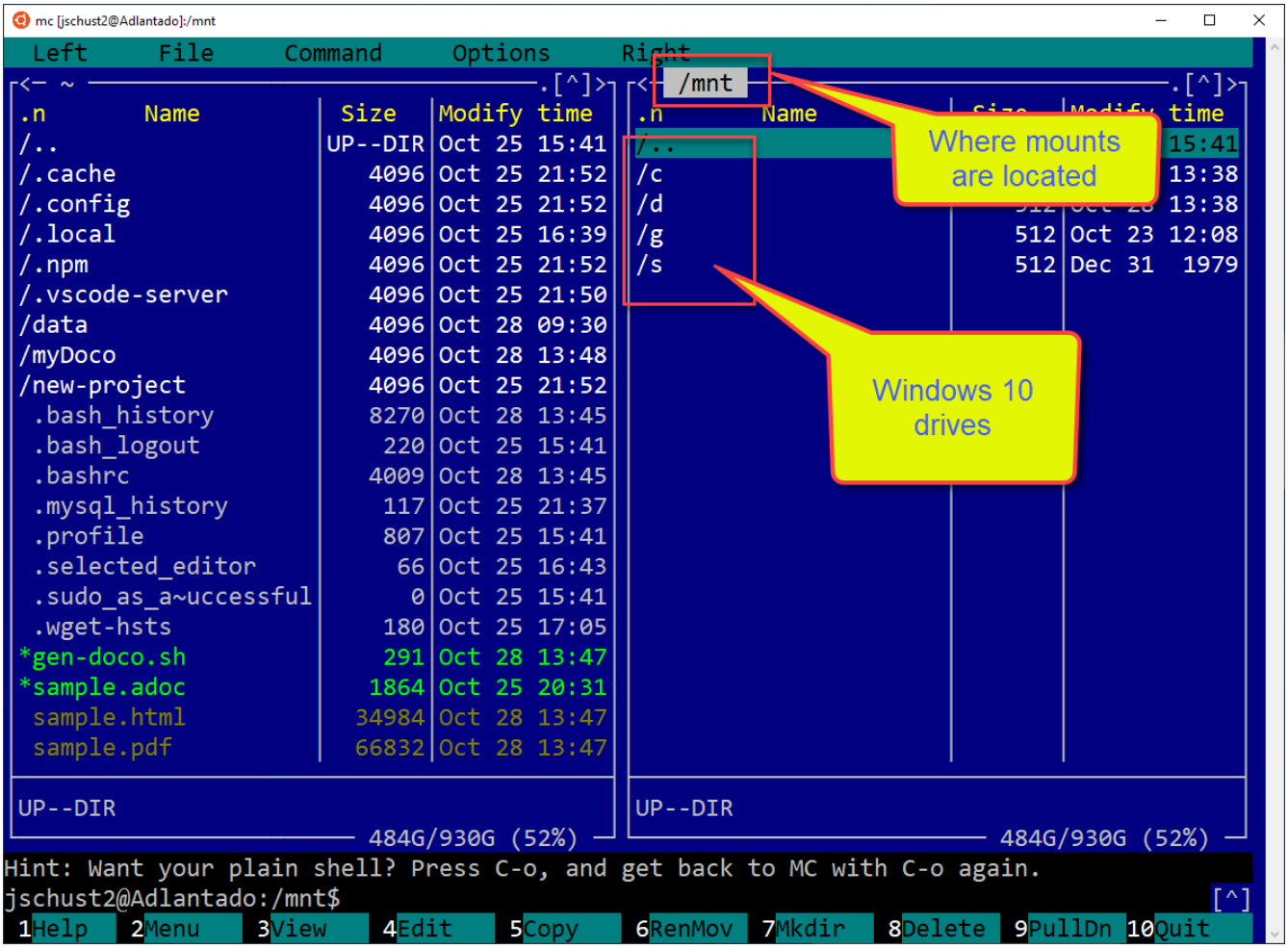


Figure 11. Windows drives mount

The easiest way to move or copy files between Windows 10 and the Ubuntu instance is to use Media Commander and go to `/mnt` folder where all the drives in Windows 10 will be shown.

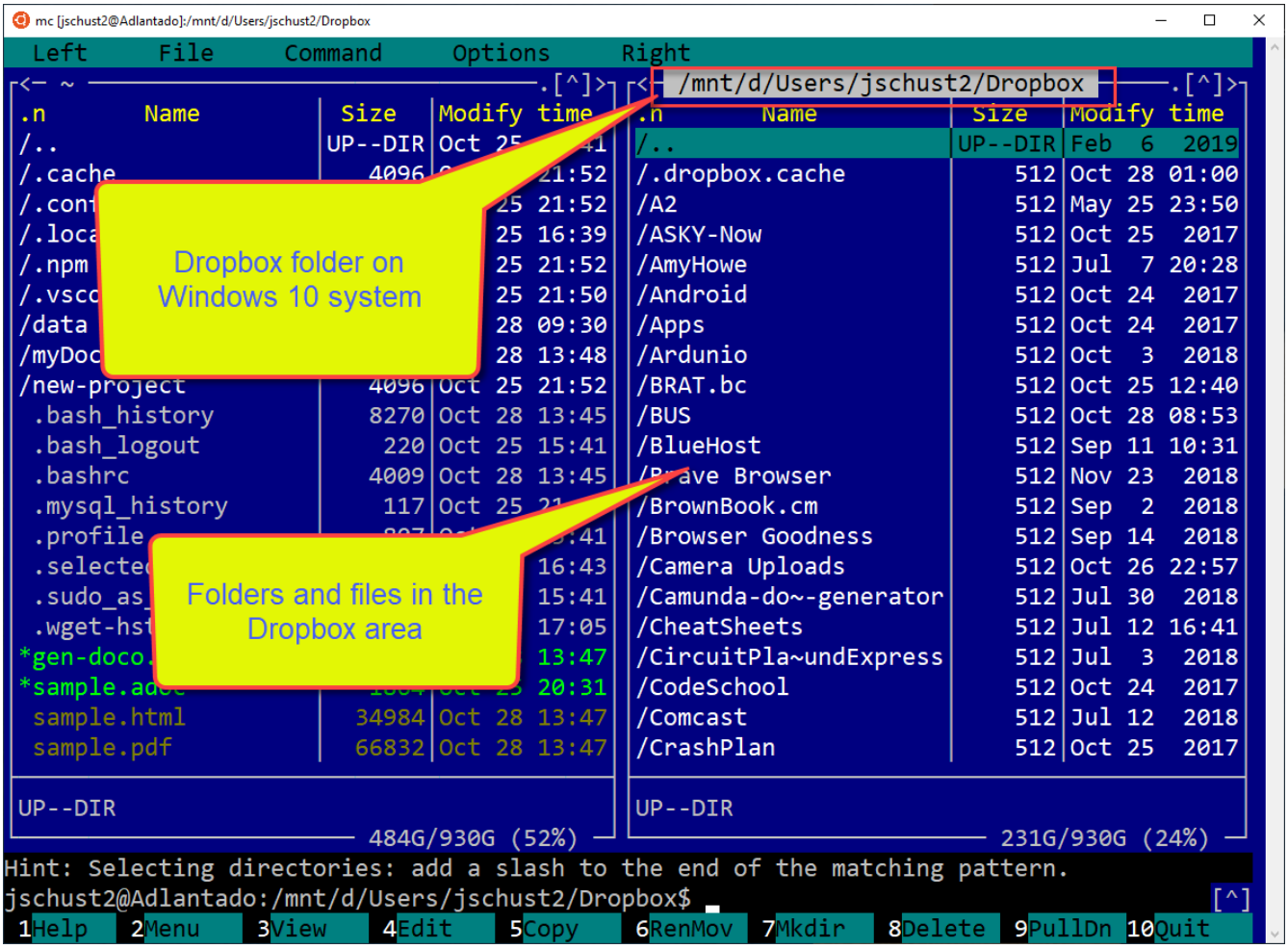


Figure 12. Windows 10 - Ubuntu transfer

11. Node installation

Working with Node and JavaScript will require the i nstallation of Node.

At the last update of this guide, Node.js 10.15.3 is the LTS release available.

When installing `node` the Python language and Python libraries iwll be updated.

When `Node` is install the Node Package Managr `npm` will also be installed

Node Install

```
jschust2@Adlantado:~$ curl -sL https://deb.nodesource.com/setup_10.x | sudo -E bash -
[sudo] password for jschust2:
Sorry, try again.
[sudo] password for jschust2:

## Installing the NodeSource Node.js 10.x repo...

## Populating apt-get cache...

+ apt-get update
Get:1 http://security.ubuntu.com/ubuntu bionic-security InRelease [88
... and a tone more ..
Fetched 5352 B in 2s (2405 B/s)
Reading package lists... Done

## Run `sudo apt-get install -y nodejs` to install Node.js 10.x and npm

jschust2@Adlantado:~$ sudo apt-get install -y nodejs
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libpython-stdlib libpython2.7-minimal libpython2.7-stdlib python python-minimal
python2.7
  python2.7-minimal
....  and a bunch more ....
Setting up libpython-stdlib:amd64 (2.7.15~rc1-1) ...
Setting up python (2.7.15~rc1-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
jschust2@Adlantado:~$
```

To verify that Node has been insalled run the following commands

Verify Node

```
jschust2@Adlantado:~$ node -v
v10.17.0
jschust2@Adlantado:~$ npm -v
6.11.3
jschust2@Adlantado:~$
```

12. Apache Web Server

Apache is one of the most used web servers on the Internet.

Some simple alternative to Apache are XAMPP or WAMPServer, however, they are not meant to

work for any production environment .

To install Apache use the following commands

Apache Installation

```
jschust2@Adlantado:~$  sudo apt-get install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3
libaprutil1-ldap
  liblua5.2-0 ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom openssl-blacklist
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-
sqlite3
  libaprutil1-ldap liblua5.2-0 ssl-cert
0 upgraded, 10 newly installed, 0 to remove and 0 not upgraded.
Need to get 1730 kB of archives.
After this operation, 6982 kB of additional disk space will be used.
Do you want to continue? [Y/n]
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 libapr1 amd64 1.6.3-2 [90.9
kB]
Get:2 http://archive.ubuntu.com/ubuntu bionic/main amd64 libaprutil1 amd64 1.6.1-2
[84.4 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic/main amd64 libaprutil1-dbd-sqlite3 amd64
1.6.1-2 [10.6 kB]
.... and a tone more ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for systemd (237-3ubuntu10.31) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ufw (0.36-0ubuntu0.18.04.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
jschust2@Adlantado:~$
```

To start the Apache web service use the following commands.

The first time you start Apache there will be a Windows firewall warning, Just agree to it.

Start Apache

```
jschust2@Adlantado:~$ sudo service apache2 start
 * Starting Apache httpd web server apache2
*
```

To verify that Apache is running use a Windows 10 browser and open the 127.0.0.1:80 page

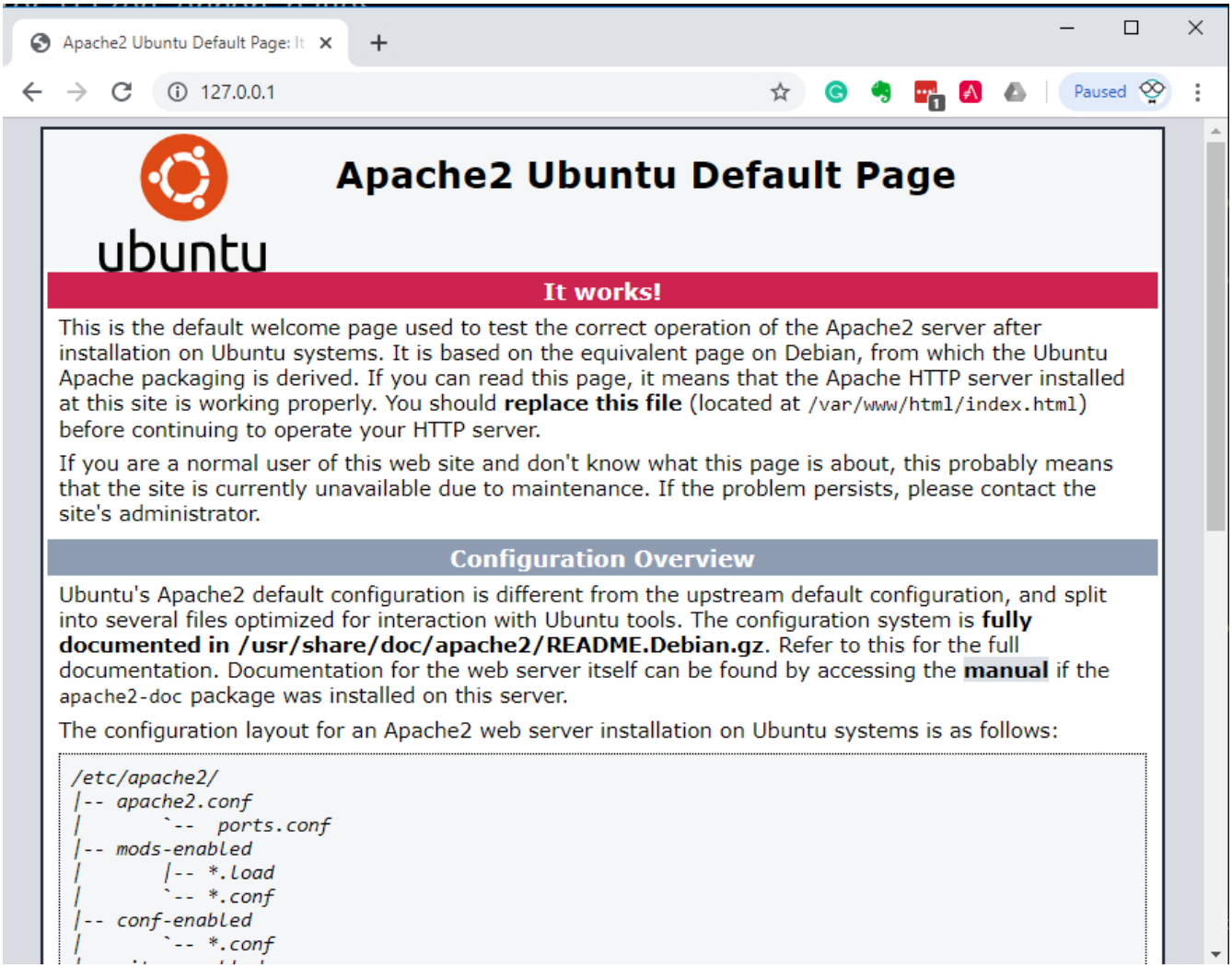


Figure 13. Apache Test

13. MySQL database

The MySQL database is one of the eaiser relational database systems to install and use.

To install MySQL use the following commands.

MySQL Installation

```
jschust2@Adlantado:~$  sudo apt-get install mysql-server mysql-client
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libaio1 libcgi-fast-perl libcgi-pm-perl libencode-locale-perl libevent-core-2.1-6
libfcgi-perl
  libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl
libhttp-message-perl
  libio-html-perl liblwp-mediatypes-perl libtimedate-perl liburi-perl mysql-client-5.7
  mysql-client-core-5.7 mysql-common mysql-server-5.7 mysql-server-core-5.7
Suggested packages:
  libdata-dump-perl libipc-sharedcache-perl libwww-perl mailx tinyca
The following NEW packages will be installed:
  libaio1 libcgi-fast-perl libcgi-pm-perl libencode-locale-perl libevent-core-2.1-6
libfcgi-perl
  libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl
libhttp-message-perl
  libio-html-perl liblwp-mediatypes-perl libtimedate-perl liburi-perl mysql-client
mysql-client-5.7
  mysql-client-core-5.7 mysql-common mysql-server mysql-server-5.7 mysql-server-core-
5.7
0 upgraded, 22 newly installed, 0 to remove and 0 not upgraded.
Need to get 21.1 MB of archives.
After this operation, 162 MB of additional disk space will be used.
Do you want to continue? [Y/n]
... ton of stuff **
Setting up mysql-server (5.7.27-0ubuntu0.18.04.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for systemd (237-3ubuntu10.31) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
jschust2@Adlantado:~$
```

To start MySQL use the following commands.

MySQL Start

```
jschust2@Adlantado:~$ sudo service mysql start
 * Starting MySQL database server mysqld
No directory, logging in with HOME=/
```

To verify that MySQL is working run the followinf commands

MySQL Testing

```
jschust2@Adlantado:~$ sudo mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 4
Server version: 5.7.27-0ubuntu0.18.04.1 (Ubuntu)

Copyright (c) 2000, 2019, Oracle and/or its affiliates. All rights reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

To create a MySQL user for testing use the following SQL commands withing the MySQL Client

The user is `jschust2` with the lame password of `password`, probably should change that later.

MySQL New User

```
mysql> CREATE USER 'jschust2'@'localhost' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.01 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'jschust2'@'localhost';
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.01 sec)

mysql>
```

There are some issues with which IP address to use to connect to MySQL. An update to this document will include the answer.

14. PHP

PHP is a server side scripting language. that is used to develop Static websites or Dynamic websites or Web applications. PHP stands for Hypertext Pre-processor,

PHP Installation

```
jschust2@Adlantado:~$ sudo apt-get install php libapache2-mod-php php-mysql php-gd
php-json php-curl php-xml php-intl
Reading package lists... Done
```

```
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme at-spi2-core dconf-gsettings-backend dconf-service fontconfig
glib-networking
  glib-networking-common glib-networking-services gsettings-desktop-schemas gtk-
update-icon-cache hicolor-icon-theme
  humanity-icon-theme libatk-bridge2.0-0 libatk1.0-0 libatk1.0-data libatspi2.0-0
libavahi-client3
  libavahi-common-data libavahi-common3 libcairo-gobject2 libcairo2 libcolord2
libcroco3 libcups2 libdatrie1 libdconf1
  libepoxy0 libgail-common libgail18 libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-
pixbuf2.0-common libgraphite2-3
  libgtk-3-0 libgtk-3-bin libgtk-3-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common
libharfbuzz0b libjson-glib-1.0-0
  libjson-glib-1.0-common liblcms2-2 libnotify4 libpango-1.0-0 libpangocairo-1.0-0
libpangoft2-1.0-0 libpixman-1-0
  libproxy1v5 librest-0.7-0 librsvg2-2 librsvg2-common libsoup-gnome2.4-1 libsoup2.4-1
libthai-data libthai0
  libwayland-client0 libwayland-cursor0 libwayland-egl1 libwxbase3.0-0v5 libwxgtk3.0-
0v5 libxcb-render0 libxcb-shm0
  libxcursor1 libxkbcommon0 notification-daemon ubuntu-mono
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libapache2-mod-php7.2 libgd3 libsodium23 libwebp6 php-common php7.2 php7.2-cli
php7.2-common php7.2-curl php7.2-gd
  php7.2-intl php7.2-json php7.2-mysql php7.2-opcache php7.2-readline php7.2-xml
Suggested packages:
  php-pear libgd-tools
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php7.2 libgd3 libsodium23 libwebp6 php php-common
php-curl php-gd php-intl
  php-json php-mysql php-xml php7.2 php7.2-cli php7.2-common php7.2-curl php7.2-gd
php7.2-intl php7.2-json
  php7.2-mysql php7.2-opcache php7.2-readline php7.2-xml
0 upgraded, 24 newly installed, 0 to remove and 0 not upgraded.
Need to get 4730 kB of archives.
After this operation, 20.2 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 php-common all 1:60ubuntu1
[12.1 kB]
Ign:2 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 php7.2-common amd64
7.2.19-0ubuntu0.18.04.2
Ign:3 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 php7.2-json amd64
7.2.19-0ubuntu0.18.04.2
Err:2 http://security.ubuntu.com/ubuntu bionic-updates/main amd64 php7.2-common amd64
7.2.19-0ubuntu0.18.04.2
... then a ton more ...
4  Not Found [IP: 2001:67c:1560:8001::11 80]
E: Unable to fetch some archives, maybe run apt-get update or try with --fix-missing?
```

```
jschust2@Adlantado:~$ sudo apt-get update
Hit:1 https://deb.nodesource.com/node_10.x bionic InRelease
Ign:2 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 InRelease
Hit:3 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 Release
Hit:4 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:5 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:6 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:7 http://archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:9 http://security.ubuntu.com/ubuntu bionic-security/main amd64 Packages [545 kB]
Get:10 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [768 kB]
Get:11 http://security.ubuntu.com/ubuntu bionic-security/main Translation-en [182 kB]
Get:12 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [617
kB]
Get:13 http://archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [275 kB]
Get:14 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1018
kB]
Get:15 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [206
kB]
Get:16 http://archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [313
kB]
Get:17 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [4024
B]
Fetched 4179 kB in 10s (421 kB/s)
Reading package lists... Done
jschust2@Adlantado:~$
```

14.1. myPHPAdmin

The myPHPAdmin is a web interface to the PHP and my SQL environment.

To Instal myPHPAdmin Use the following command

```
sudo apt-get install -y phpmyadmin
```

There will be a few configuration screens

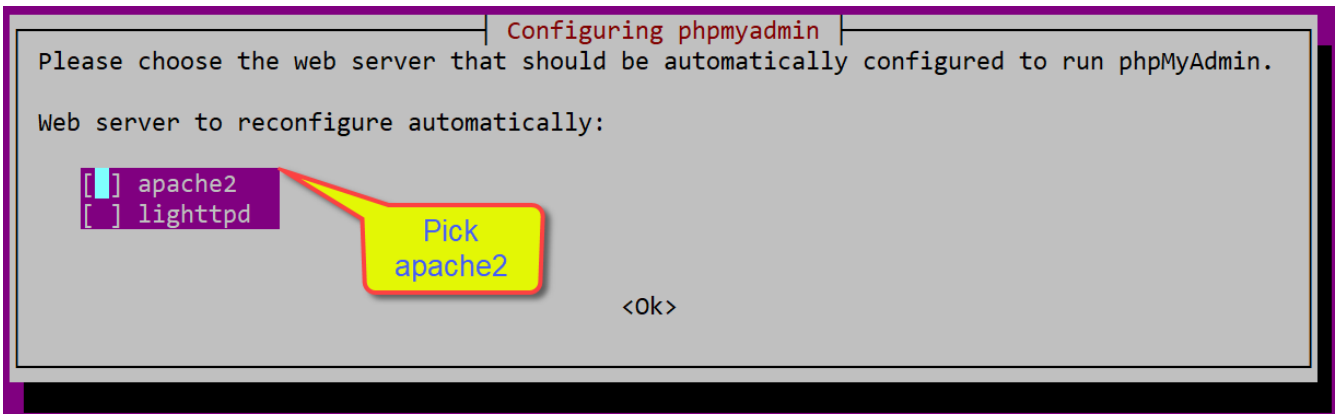


Figure 14. myPHPAdmin Server

Make sure the MySQL Server has been started, see steps below for this process.

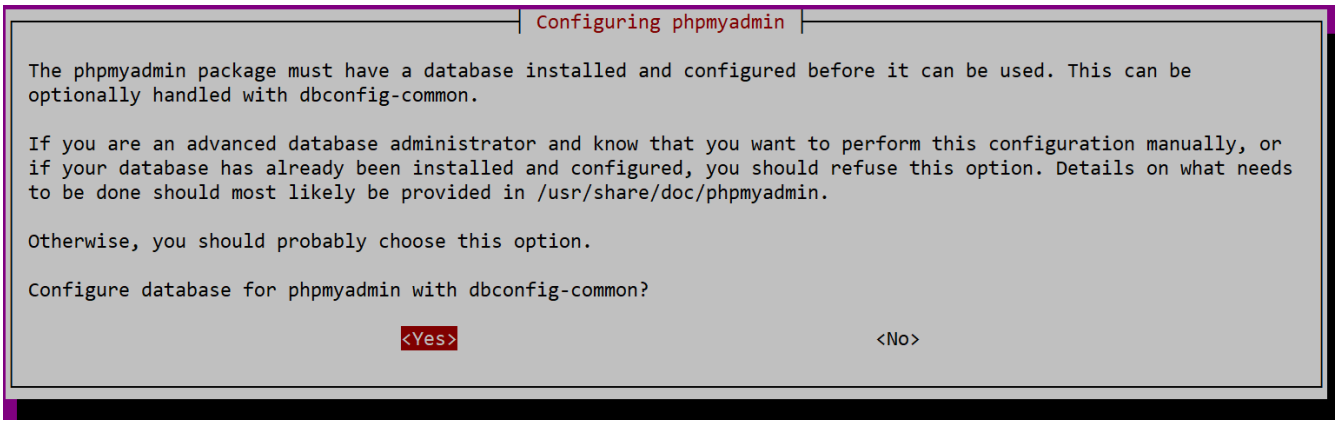


Figure 15. MySQLAdmin Database

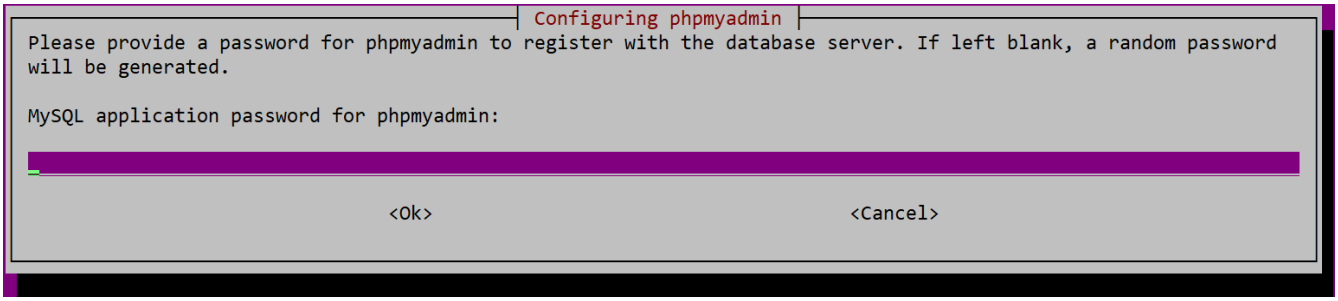


Figure 16. mySQLAdmin Password

To access mySQLAdmin make sure that the Appache Service is tuened on then open a browser and enter the following URL

```
127.0.0.1/mySQLAdmin
```

The User id we should use is the one created in the MySQL install `jschust2` and the password you entered in the configutation screen above. In my case it is `password`. If you use the default PHPMyAdmin user `phpmysql` and the password you created at installation you will be able to login but you will **not** be able to create a new database

14.2. Chinook Database

One of the datbases I use for doing SQL training is Chinook.

You can us PHPMyAdmin to run the Chinook creation script for MySQL.

The Chinook creation script can be found at this Link

After you import the script and run it you should see the Chinook database and it's tables.

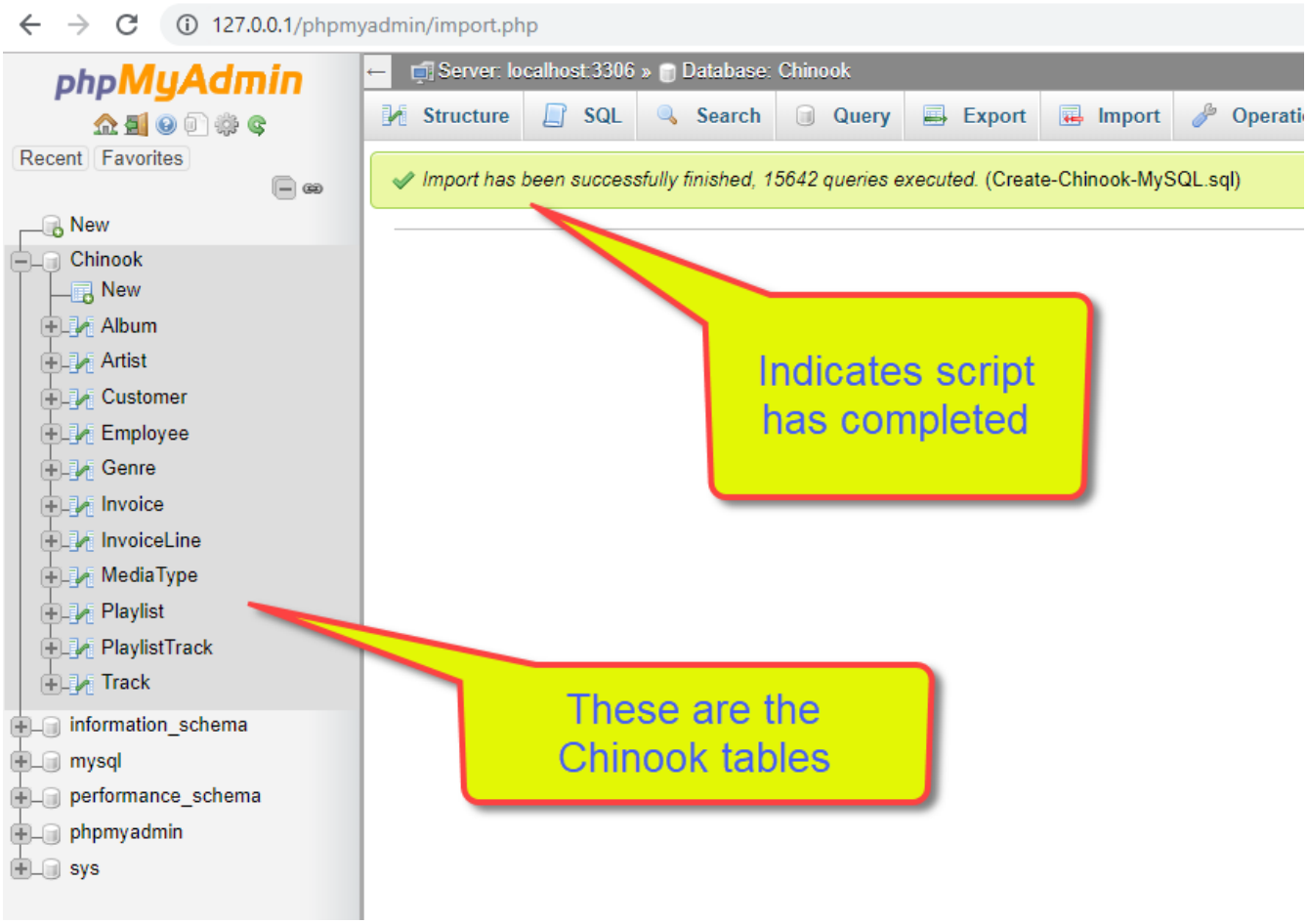


Figure 17. Chinook Imported

There is a SQL as a Second Language leanring guide that is based on the Chnook database. The learning guide is specific to Teradata but, most if will work with the MySQL version of Chinook.

To view the SASL learning guide use the following link

15. MyWebSQL

This tool is a replacement for MyPHPAdmin which is a little dated. MyWebSQL requires Apache, PHP and MySQL to be installed and running.

A copy of the ZIP file with the entire MyWebSQL can be found at this link

Using SUDO or SUDO MC unzip the ZIP file, the result should be a directory `mywebsql`. Copy the entire contents of the `mywebsql` to the `\var\www\html` folder.

You should end up with something that looks like

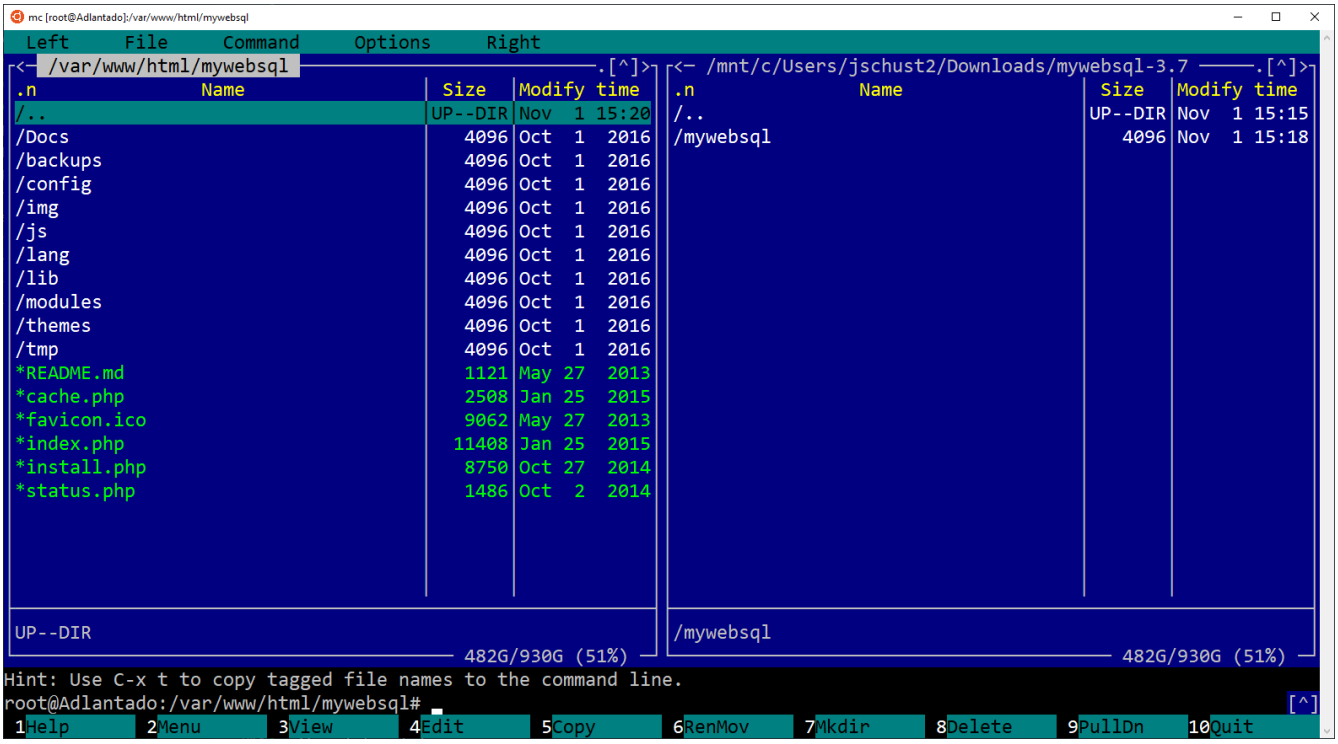


Figure 18. After MyWebSQL transfer

To run MyWebSQL use the following URL

```
127.0.0.1/mywebsql
```

You should get a login screen, use the User created during the install of SQL Server User: jschust2 Pass: password as this creditentials provide the abaility to create databases.

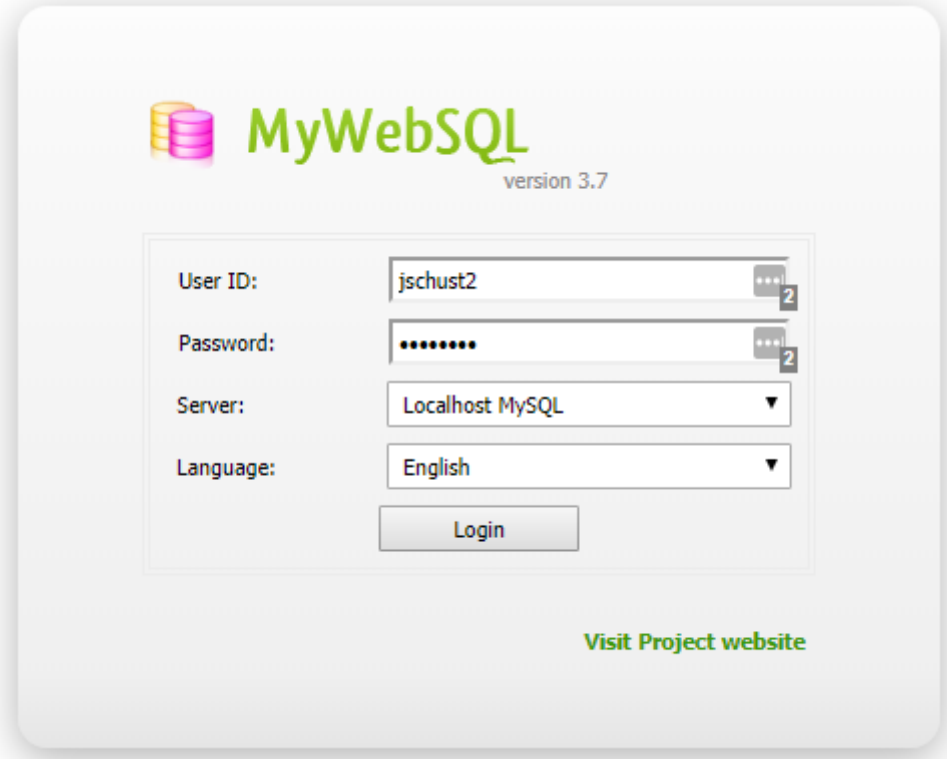


Figure 19. MyWebSQL Login

15.1. SQLite databases

To connect to and use SQLite databases, you will need to enable the configuration option in the config file `servers.php`. Edit the `servers.php` file in the config folder of MyWebSQL installation, and uncomment the configuration option for SQLite. You will also need to set the folder path correctly where you have saved your SQLite databases.

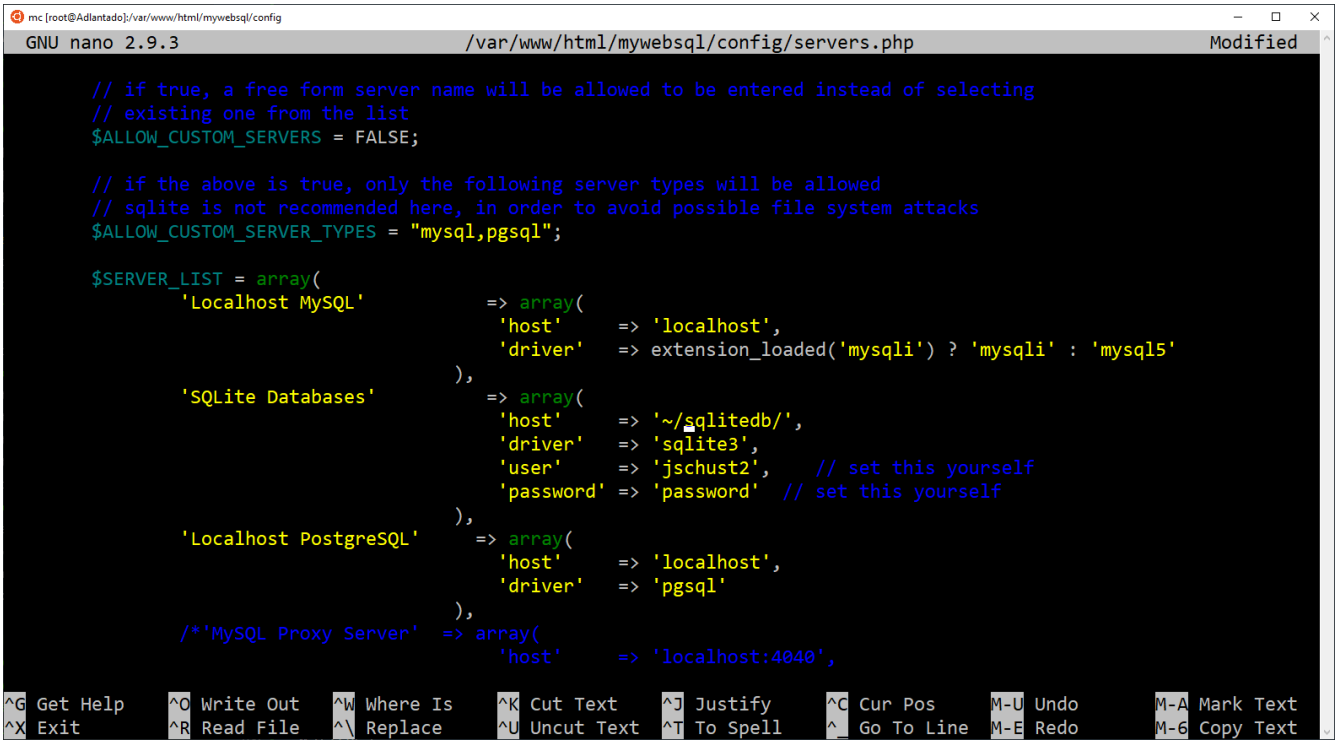


Figure 20. MyWebSQL SQLite settings

16. SQLite

SQLite is a lightweight database software. It is a command line application. You must use the command line or SQLite API on other programming languages to use SQLite database.

SQLite 3 is the latest version at the time of this writing. SQLite 3 is available in the official package repository of Ubuntu 18.04 LTS.

SQLite Instllation

```
jschust2@Adlantado:~$ sudo apt install sqlite3
[sudo] password for jschust2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme at-spi2-core dconf-gsettings-backend dconf-service fontconfig
glib-networking
  glib-networking-common glib-networking-services gsettings-desktop-schemas gtk-
update-icon-cache hicolor-icon-theme
  humanity-icon-theme libatk-bridge2.0-0 libatk1.0-0 libatk1.0-data libatspi2.0-0
libavahi-client3
  libavahi-common-data libavahi-common3 libcairo-gobject2 libcairo2 libcolord2
libcroco3 libcups2 libdatrie1 libdconf1
  libepoxy0 libgail-common libgail18 libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-
pixbuf2.0-common libgraphite2-3
  libgtk-3-0 libgtk-3-bin libgtk-3-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common
libharfbuzz0b libjson-glib-1.0-0
  libjson-glib-1.0-common liblcms2-2 libnotify4 libpango-1.0-0 libpangocairo-1.0-0
libpangoft2-1.0-0 libpixman-1-0
  libproxy1v5 librest-0.7-0 librsvg2-2 librsvg2-common libsoup-gnome2.4-1 libsoup2.4-1
libthai-data libthai0
  libwayland-client0 libwayland-cursor0 libwayland-egl1 libwxbase3.0-0v5 libwxgtk3.0-
0v5 libxcb-render0 libxcb-shm0
  libxcursor1 libxkbcommon0 notification-daemon ubuntu-mono
Use 'sudo apt autoremove' to remove them.
Suggested packages:
  sqlite3-doc
The following NEW packages will be installed:
  sqlite3
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 753 kB of archives.
After this operation, 2481 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 sqlite3 amd64 3.22.0-
1ubuntu0.1 [753 kB]
Fetched 753 kB in 3s (235 kB/s)
Selecting previously unselected package sqlite3.
(Reading database ... 51403 files and directories currently installed.)
Preparing to unpack .../sqlite3_3.22.0-1ubuntu0.1_amd64.deb ...
Unpacking sqlite3 (3.22.0-1ubuntu0.1) ...
Setting up sqlite3 (3.22.0-1ubuntu0.1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
jschust2@Adlantado:~$
```

If the SQLite database you want to connect to is `chinook`, in your current directory, then enter the following command

```
sqlite3 chinook
```

17. Mongo

Mongo is a NoSQL database that is very powerful and popular.

To install Mongo use the following commands

```
sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --recv
2930ADAE8CAF5059EE73BB4B58712A2291FA4AD5
echo "deb [ arch=amd64,arm64 ] https://repo.mongodb.org/apt/ubuntu xenial/mongodb-
org/3.6 multiverse" | sudo tee /etc/apt/sources.list.d/mongodb-org-3.6.list
sudo apt-get update
sudo apt-get install -y mongodb-org
cd ~
sudo mkdir -p data/db
```

This is what the Mongo installation may look like.

Mongo Installationm

```
jschust2@Adlantado:~$ sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80
--recv 2930ADAE8CAF5059EE73BB4B58712A2291FA4AD5
[sudo] password for jschust2:
Executing: /tmp/apt-key-gpghome.VQIPQmmzQi/gpg.1.sh --keyserver
hkp://keyserver.ubuntu.com:80 --recv 2930ADAE8CAF5059EE73BB4B58712A2291FA4AD5
gpg: key 58712A2291FA4AD5: public key "MongoDB 3.6 Release Signing Key
<packaging@mongodb.com>" imported
gpg: Total number processed: 1
gpg:               imported: 1
jschust2@Adlantado:~$ echo "deb [ arch=amd64,arm64 ]
https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 multiverse" | sudo tee
/etc/apt/sources.list.d/mongodb-org-3.6.list
deb [ arch=amd64,arm64 ] https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6
multiverse
jschust2@Adlantado:~$ sudo apt-get update
Hit:1 https://deb.nodesource.com/node_10.x bionic InRelease
Hit:2 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:3 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:4 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Ign:5 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 InRelease
Get:6 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 Release [3457 B]
Get:7 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6 Release.gpg [801 B]
Get:8 http://archive.ubuntu.com/ubuntu bionic-backports InRelease [74.6 kB]
Get:9 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [764 kB]
Get:10 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6/multiverse arm64
Packages [10.7 kB]
Get:11 https://repo.mongodb.org/apt/ubuntu xenial/mongodb-org/3.6/multiverse amd64
```

```
Packages [10.7 kB]
Get:12 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1016
kB]
Fetched 2058 kB in 5s (418 kB/s)
Reading package lists... Done
jschust2@Adlantado:~$ sudo apt-get install -y mongodb-org
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme at-spi2-core dconf-gsettings-backend dconf-service fontconfig
glib-networking
  glib-networking-common glib-networking-services gsettings-desktop-schemas gtk-
update-icon-cache hicolor-icon-theme
  humanity-icon-theme libatk-bridge2.0-0 libatk1.0-0 libatk1.0-data libatspi2.0-0
libavahi-client3
  libavahi-common-data libavahi-common3 libcairo-gobject2 libcairo2 libcolord2
libcroco3 libcups2 libdatrie1 libdconf1
  libepoxy0 libgail-common libgail18 libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-
pixbuf2.0-common libgraphite2-3
  libgtk-3-0 libgtk-3-bin libgtk-3-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common
libharfbuzz0b libjson-glib-1.0-0
  libjson-glib-1.0-common liblcms2-2 libnotify4 libpango-1.0-0 libpangocairo-1.0-0
libpangoft2-1.0-0 libpixman-1-0
  libproxy1v5 librest-0.7-0 librsvg2-2 librsvg2-common libsoup-gnome2.4-1 libsoup2.4-1
libthai-data libthai0
  libwayland-client0 libwayland-cursor0 libwayland-egl1 libwxbase3.0-0v5 libwxgtk3.0-
0v5 libxcb-render0 libxcb-shm0
  libxcursor1 libxkbcommon0 notification-daemon ubuntu-mono
... and a ton more ...
Adding system user `mongodb' (UID 112) ...
Adding new user `mongodb' (UID 112) with group `nogroup' ...
Not creating home directory `/home/mongodb'.
Adding group `mongodb' (GID 117) ...
Done.
Adding user `mongodb' to group `mongodb' ...
Adding user mongodb to group mongodb
Done.
Setting up mongodb-org (3.6.14) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
jschust2@Adlantado:~$
```

Set up the area where the Mongo database will reside.

Mongo DB Setup

```
jschust2@Adlantado:~$ cd ~
jschust2@Adlantado:~$ pwd
/home/jschust2
jschust2@Adlantado:~$ sudo mkdir -p data/db
jschust2@Adlantado:~$
```

To start the Mongo Services use the following command, in a separate WSL window. ping 127.0.0.1 sudo mongod --dbpath ~/data/db --bind_ip 127.0.0.1

To run the WSL Mongo Client use the following command

```
mongo
```

This document is not meant to be a tutorial on Mongo but the following Mongo Cheat Sheet link will be useful.

There are some issues with which IP address to use to connect to Mongo. An update to this document will include the answer.

18. GIT Version control

GIT the version control software used by most developers and GitHub should automatically installed with the Ubuntu 18.04.

To verify that GIT is installed use the following command.

GIT Verification

```
jschust2@Adlantado:~$ git --version
git version 2.17.1
```

19. Visual Studio Code

While VSCode **can not** run inside of the Ubuntu WSL instance however, an VSCodce extension makes using the WSL instance much easier.

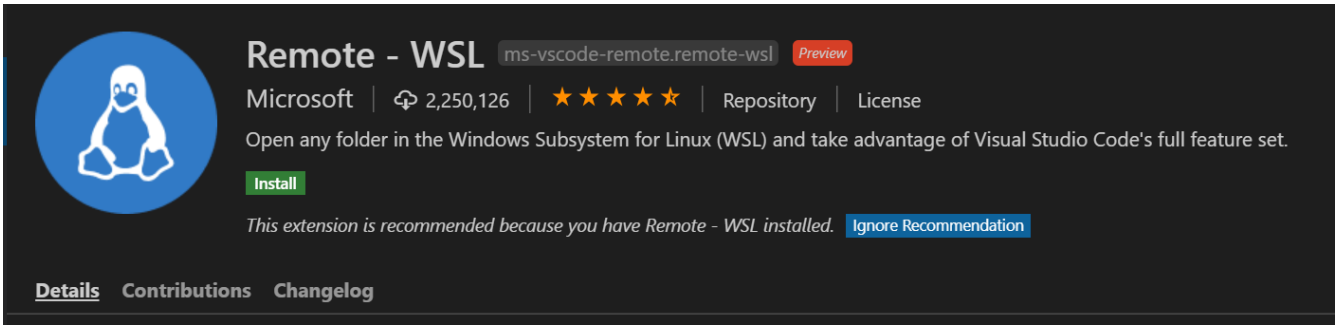


Figure 21. Remote - WSL Extension

Create a project directory on Ubuntu WSL and start Visual Studio code with the following commands

Code Heading

```
jschust2@Adlantado:~$ mkdir new-project
jschust2@Adlantado:~$ cd new-project
jschust2@Adlantado:~/new-project$ code .
Installing VS Code Server 6ab598523be7a800d7f3eb4d92d7ab9a66069390
Downloading: 100%
Unpacking: 100%
```

Visual Studio Code will open in the Ubuntu new project folder and allow you to edit and run Node code from there.

Figure 22. Visual Studio Code development

20. Shutdown WSL

Sometimes it is necessary to Shutdown the Ubuntu WSL instance. Just closing the WSL window doesn't close the Ubuntu instance. There are a few WSL shutdown methods that require using Windows Powershell.

To shutdown the WSL Ubuntu instance from within Ubuntu use the following command.

```
wslconfig.exe /t Ubuntu-18.04
```

21. Backup and Restore

The entire Win 10 Ubuntu WSL can be saved, copied to another system and restored. The export file is in a `tar` format and can be quite large depending on how much additional software you have installed.

To back up the Ubuntu 18.04 WSL instance us the following command

```
wsl --export Ubuntu-18.04 ubuntu.tar
```

Copy the `tar` file to the other Windows 10 system and restore using the following command

```
wsl --import Ubuntu-18.04 C:\Users\jschust2\ubuntu
C:\users\jschust2\download\ubuntu.tar
```

The import and export features were added in the May 2019 Update—that's Windows 10 version 1903.

22. A little fun

What installation would be complete with out a little…

```
curl -s -L http://bit.ly/10hA8iC | bash
```

```
telnet towel.blinkenlights.nl
```

```
sudo apt-get install cmatrix
cmatrix
```

```
curl parrot.live
```

23. Document History

Table 1. Document History

Date	Version	Author	Description
10/30/2019	V2.1e	JHRS Added MySQL update and SQLite	10/28/2019
V2.1d	JHRS	Mongo, GIT	10/27/2019
V2.1c	JHRS	Added backup/restore and some fun	10/25/2019