

Project Network And System Administration

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group 932

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Server operating system - Linux, Windows

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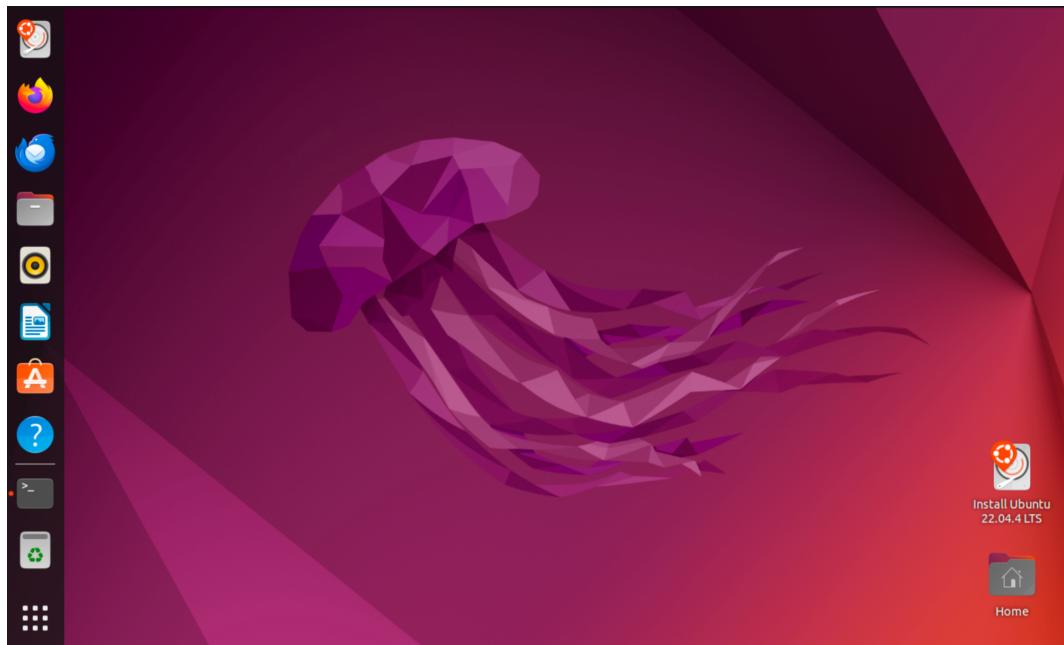
Virtualization software - VMWare Fusion

I installed **VMWare Fusion** virtualization software.

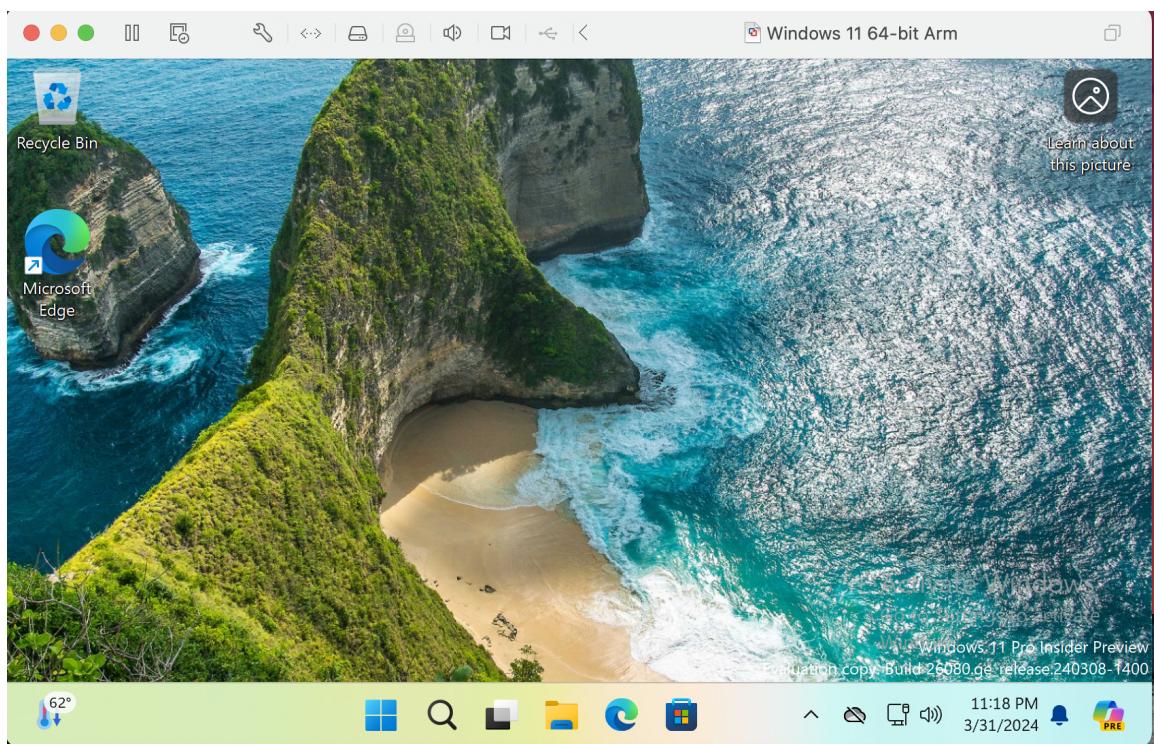
Server operating system - Linux, Windows

I installed **2 Operating Systems (OS)**

- **Linux**



- **Windows** (couldn't install Windows Server on ARM64 with VMWare Fusion)



SSH

- OpenSSH is a powerful collection of tools for the remote control of, and transfer of data between, networked computers.
- I installed ssh in the Linux machine with `sudo apt install openssh-server`.

```
ubuntu@ubuntu:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.6).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

- I created a new user named ralucarusu to the SSH server `sudo adduser ralucarusu`.

```
ubuntu@ubuntu:~$ sudo adduser ralucarusu
Adding user `ralucarusu' ...
Adding new group `ralucarusu' (1001) ...
Adding new user `ralucarusu' (1001) with group `ralucarusu' ...
Creating home directory `/home/rilucarusu' ...
Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password fails the dictionary check - it is based on a (reversed) dictionary word
Retype new password:
passwd: password updated successfully
Changing the user information for ralucarusu
Enter the new value, or press ENTER for the default
      Full Name []:
      Room Number []:
      Work Phone []:
      Home Phone []:
      Other []:
```

- Gave it sudo access and allowed SSH login to that user `usermod -aG sudo ralucarusu`

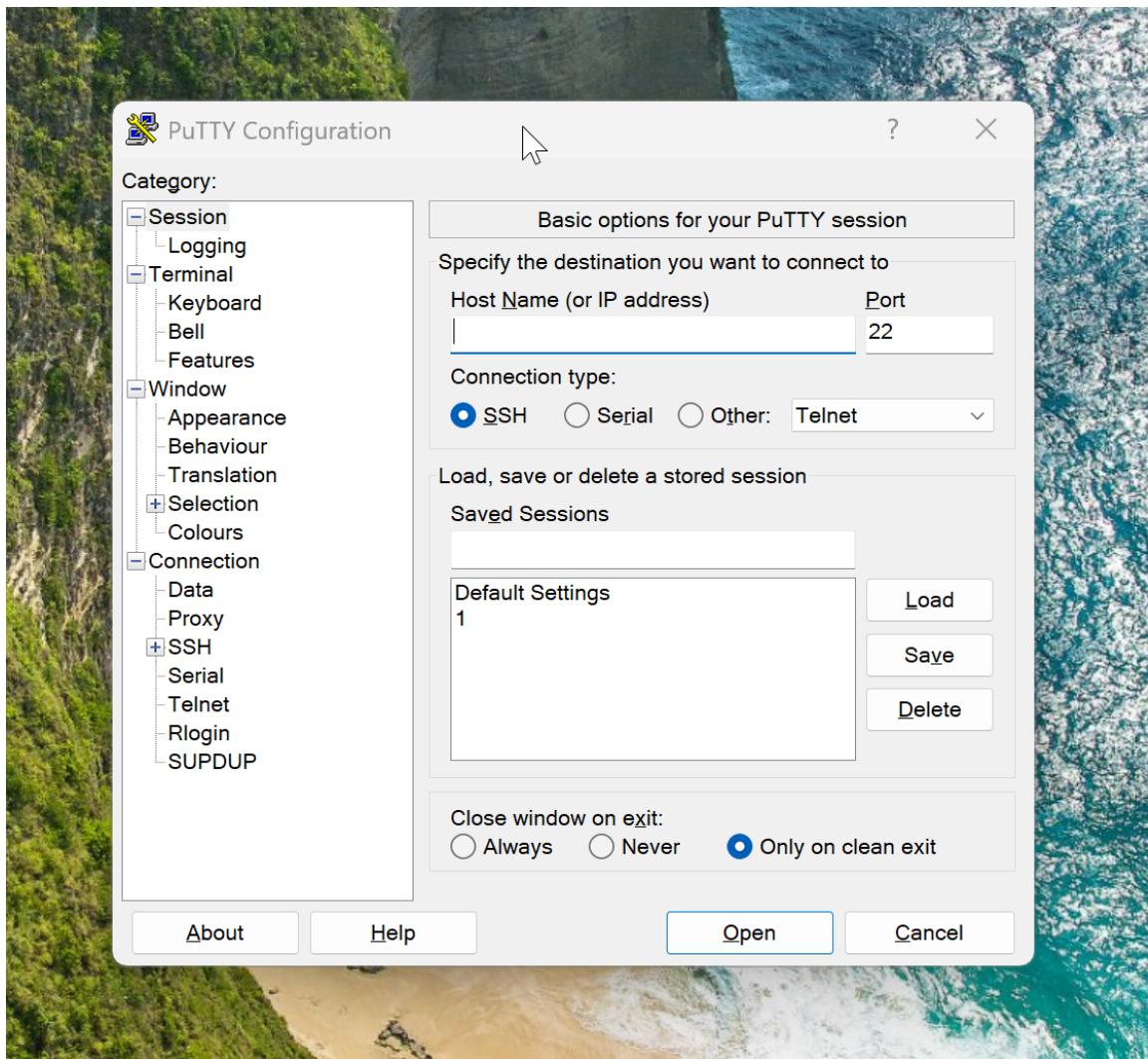
```
ubuntu@ubuntu:~$ usermod -aG sudo ralucarusu
```

- Found the IP address with `ifconfig`.

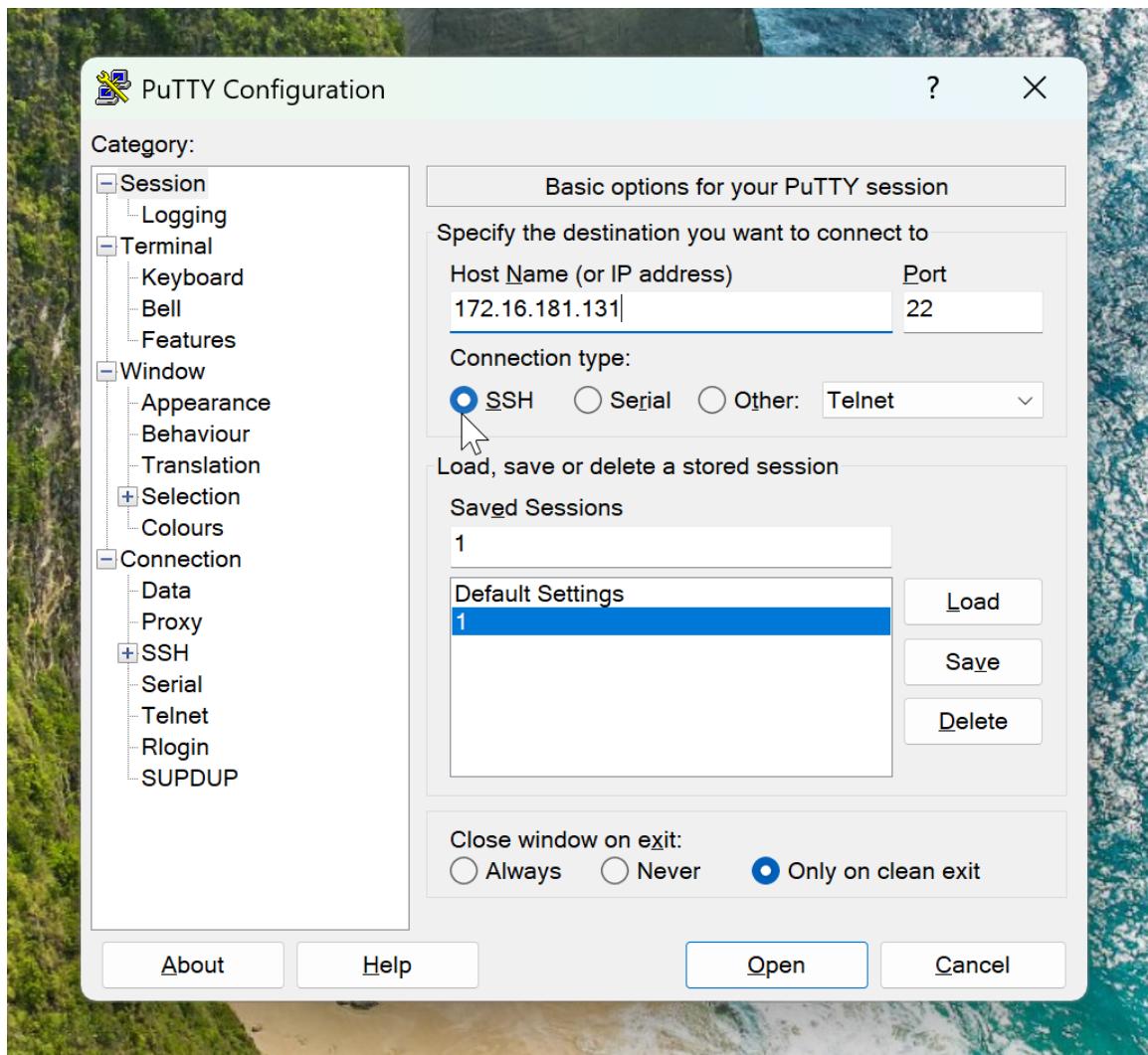
```
ubuntu@ubuntu:~$ ifconfig
ens160: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
      inet 172.16.181.131 brd 172.16.181.255  netmask 255.255.255.0
          broadcast 172.16.181.255
      inet6 fe80::2a34:7052:4265:20a8  prefixlen 64  scopeid 0x20<link>
          ether 00:0c:29:5c:ee:10  txqueuelen 1000 (Ethernet)
          RX packets 83353  bytes 117637672 (117.6 MB)
          RX errors 0  dropped 0  overruns 0  frame 0
          TX packets 8987  bytes 937726 (937.7 KB)
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
          device interrupt 44  memory 0x3fe00000-3fe20000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
      inet 127.0.0.1  netmask 255.0.0.0
      inet6 ::1  prefixlen 128  scopeid 0x10<host>
          loop  txqueuelen 1000 (Local Loopback)
          RX packets 1567  bytes 185260 (185.2 KB)
          RX errors 0  dropped 0  overruns 0  frame 0
          TX packets 1567  bytes 185260 (185.2 KB)
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
```

- Installed **Putty** on the Windows machine.



- Used the new user & password and **Putty** on the Windows machine to connect to the SSH server of the Linux machine.



```
ralucarusu@ubuntu: ~
login as: ralucarusu
ralucarusu@172.16.181.131's password:
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.5.0-27-generic aarch64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ralucarusu@ubuntu:~$
```

MAIL (port 25)

- Started by installing Postfix with `sudo apt install postfix`.

```
ubuntu@ubuntu:~$ sudo apt install postfix
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
postfix is already the newest version (3.6.4-1ubuntu1.3).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

- I choose `Internet Site` as Mail Configuration.
- I used `ralucarusu` as mail name.
- This listens on `port 25`.

- To check I used

- `netstat -ltnp`

```
ubuntu@ubuntu:~$ netstat -ltnp
(Not all processes could be identified, non-owned process info
will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State      PID/Program name
tcp     0      0 127.0.0.1:631           0.0.0.0:*          LISTEN
tcp     0      0 127.0.0.1:33060         0.0.0.0:*          LISTEN
tcp     0      0 127.0.0.53:53          0.0.0.0:*          LISTEN
tcp     0      0 0.0.0.0:25            0.0.0.0:*          LISTEN
tcp     0      0 0.0.0.0:22            0.0.0.0:*          LISTEN
tcp     0      0 127.0.0.1:3306         0.0.0.0:*          LISTEN
tcp6    0      0 ::1:631              ::*:*
tcp6    0      0 ::ffff:25             ::*:*
tcp6    0      0 ::ffff:22             ::*:*
tcp6    0      0 ::ffff:80             ::*:*
```

- `telnet [ip] [port]`

```
ubuntu@ubuntu:~$ telnet 127.0.0.1 22
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^>'.
SSH-2.0-OpenSSH_8.9p1 Ubuntu-3ubuntu0.6
```

- Then I installed mailutils with `sudo apt install mailutils`.

```
ubuntu@ubuntu:~$ sudo apt -y install mailutils
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  gsasl-common guile-3.0-libs libgsasl7 libmailutils8 libmysqlclient21
  libntlm0 libpq5 mailutils-common mysql-common
Suggested packages:
  mailutils-mh mailutils-doc
The following NEW packages will be installed:
  gsasl-common guile-3.0-libs libgsasl7 libmailutils8 libmysqlclient21
  libntlm0 libpq5 mailutils mailutils-common mysql-common
0 upgraded, 10 newly installed, 0 to remove and 0 not upgraded.
```

- To send a short email from the command line I used the command `echo text | mail -s subject1 root` which sends an email to the `root` user with the subject "subject1" and the body containing the word "text".

```
ubuntu@ubuntu:~$ echo text | mail -s subject1 root
```

- Then I used the command `sudo cat /var/mail/root` that uses `sudo` to run the `cat` command with superuser privileges, allowing it to read the contents of the mail file for the `root` user, located at `/var/mail/root`. This displays the `root` user's email messages stored on the system directly in the terminal to see that the email was sent.

```
ubuntu@ubuntu:~$ sudo cat /var/mail/root
From ubuntu@ubuntu Sun Mar 31 16:44:03 2024
Return-Path: <ubuntu@ubuntu>
X-Original-To: root
Delivered-To: root@ubuntu.loca domain
Received: by ubuntu.loca domain (Postfix, from userid 999)
          id 207DB2D8C; Sun, 31 Mar 2024 16:44:03 +0000 (UTC)
Subject: subject1
To: root@ubuntu.loca domain
User-Agent: mail (GNU Mailutils 3.14)
Date: Sun, 31 Mar 2024 16:44:03 +0000
Message-Id: <20240331164403.207DB2D8C@ubuntu.loca domain> []
From: Live session user <ubuntu@ubuntu>

text
```

- Another way was to use `sudo mail` that runs the `mail` program with superuser privileges, enabling access to the root user's mail. This allows reading, sending, and managing email messages directly from the command line for the system's root account.

```
ubuntu@ubuntu:~$ sudo mail
"/var/mail/root": 1 message 1 new
>N  1 Live session user  Sun Mar 31 16:44  14/426  subject1
?
Return-Path: <ubuntu@ubuntu>
X-Original-To: root
Delivered-To: root@ubuntu.loca domain
Received: by ubuntu.loca domain (Postfix, from userid 999)
          id 207DB2D8C; Sun, 31 Mar 2024 16:44:03 +0000 (UTC)
Subject: subject1
To: root@ubuntu.loca domain
User-Agent: mail (GNU Mailutils 3.14)
Date: Sun, 31 Mar 2024 16:44:03 +0000
Message-Id: <20240331164403.207DB2D8C@ubuntu.loca domain> []
From: Live session user <ubuntu@ubuntu>

text
```

- `sudo apt install alpine`

```
ubuntu@ubuntu:~$ sudo apt install alpine
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  alpine-doc mlock
The following NEW packages will be installed:
  alpine alpine-doc mlock
0 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 2777 kB of archives.
After this operation, 9630 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://ports.ubuntu.com/ubuntu-ports jammy/universe arm64 alpine arm64 2.2
5+dfsg1-1build1 [11.8 kB]
Get:2 http://ports.ubuntu.com/ubuntu-ports jammy/universe arm64 alpine-arm64 2.2
5+dfsg1-1build1 [2416 kB]                                 I
Get:3 http://ports.ubuntu.com/ubuntu-ports jammy/universe arm64 alpine-doc all 2
.25+dfsg1-1build1 [349 kB]
Fetched 2777 kB in 1s (3879 kB/s)
Selecting previously unselected package mlock.
```

WEB with LAMP (Linux, Apache, MySQL, PHP/Perl/Python)

- Then I ran `sudo apt install lamp-server^` to install the `lamp-server` meta-package. This meta-package is a convenient way to install a LAMP stack, which includes Linux, Apache, MySQL, and PHP, indicated by the caret (^) at the end, which signifies a task or a meta-package in APT syntax.

```
ubuntu@ubuntu:~$ sudo apt install lamp-server^
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'libevent-pthreads-2.1-7' for task 'lamp-server'
Note, selecting 'libperl5.34' for task 'lamp-server'                                I
Note, selecting 'libcurl4' for task 'lamp-server'
Note, selecting 'libtmeate-perl' for task 'lamp-server'
Note, selecting 'libhtml-tagset-perl' for task 'lamp-server'
Note, selecting 'libgdbm-compat4' for task 'lamp-server'
Note, selecting 'libssh-4' for task 'lamp-server'
Note, selecting 'ssl-cert' for task 'lamp-server'
Note, selecting 'libfcgi-perl' for task 'lamp-server'
Note, selecting 'perl' for task 'lamp-server'
Note, selecting 'libldap-common' for task 'lamp-server'
Note, selecting 'libaio1' for task 'lamp-server'
Note, selecting 'libaprutil-dbd-sqlite3' for task 'lamp-server'
Note, selecting 'mysql-server-8.0' for task 'lamp-server'
Note, selecting 'libapr1' for task 'lamp-server'
Note, selecting 'libsasl2-modules' for task 'lamp-server'
```

- Then I configured an apache page by editing with `nano` the `/var/www/html/index.html` website file.

```
ubuntu@ubuntu:~$ cd /var/www/html/
ubuntu@ubuntu:/var/www/html$ ls
index.html
```

```
ubuntu@ubuntu:/var/www/html$ sudo nano index.html
```

```
GNU nano 6.2                               /var/www/html/index.html
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/1999/xhtml">
<html xmlns="http://www.w3.org/1999/xhtml">
<!--
    Modified from the Debian original for Ubuntu
    Last updated: 2022-03-22
    See: https://launchpad.net/bugs/1966004
-->
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>RALUCA RUSU page</title>
    <style type="text/css" media="screen">
        * {
            margin: 0px 0px 0px 0px;
            padding: 0px 0px 0px 0px;
        }

        body, html {
            padding: 3px 3px 3px 3px;

            background-color: #D8DBE2;
        }
    

```

[Read 363 lines]

^G Help **^O Write Out** **^W Where Is** **^K Cut** **^T Execute** **^C Location**
^X Exit **^R Read File** **^L Replace** **^U Paste** **^J Justify** **^/ Go To Line**

```
GNU nano 6.2                               /var/www/html/index.html
<body>
    <div class="main_page">
        <div class="page_header floating_element">
            
        </div>
        <span style="margin-top: 1.5em;" class="floating_element">
            RALUCA RUSU page
        </span>
    </div>
    <div class="banner">
        <div id="about"></div>
        It works!
    </div>

    </div>
    <div class="content_section floating_element">
        <div class="content_section_text">
            <p>
                This is the default welcome page used to test the correct
            </p>

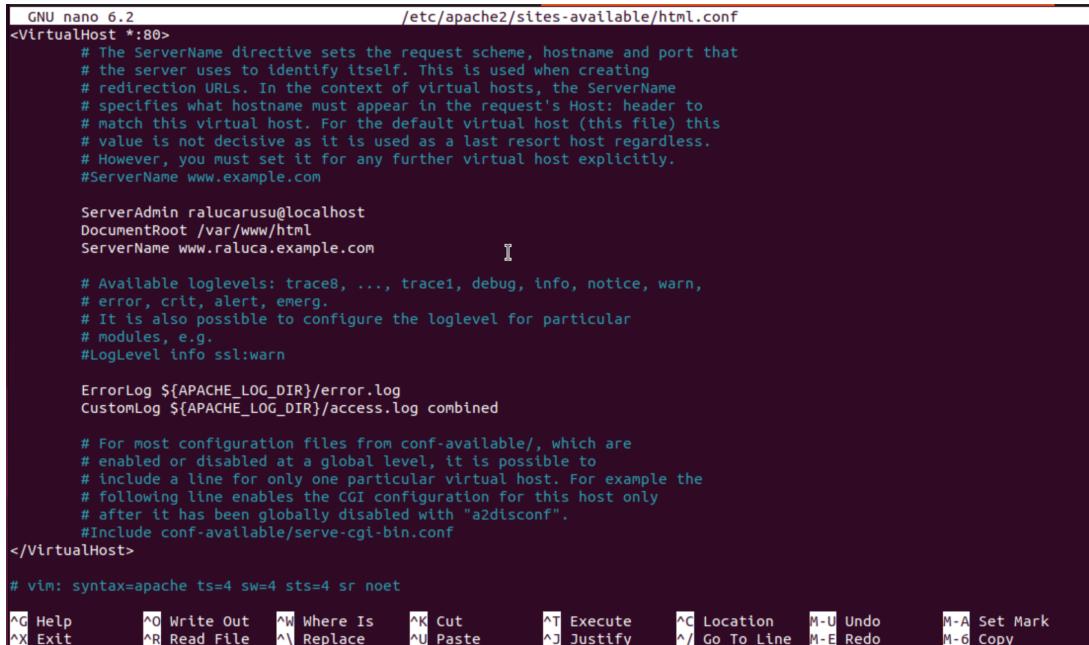
```

^G Help **^O Write Out** **^W Where Is** **^K Cut** **^T Execute** **^C Location**
^X Exit **^R Read File** **^L Replace** **^U Paste** **^J Justify** **^/ Go To Line**

- Add a website config by going into the `/etc/apache2/sites-available` folder and coping with `cp` the default config file `000-default.conf` into the `html.conf` file to create a new and customized site configuration.

```
ubuntu@ubuntu:~$ cd /etc/apache2/sites-available
ubuntu@ubuntu:/etc/apache2/sites-available$ sudo cp 000-default.conf html.conf
ubuntu@ubuntu:/etc/apache2/sites-available$ sudo nano html.conf
```

- Then editing the html.conf file like this:



```
GNU nano 6.2                               /etc/apache2/sites-available/html.conf
<VirtualHost *:80>
    # The ServerName directive sets the request scheme, hostname and port that
    # the server uses to identify itself. This is used when creating
    # redirection URLs. In the context of virtual hosts, the ServerName
    # specifies what hostname must appear in the request's Host: header to
    # match this virtual host. For the default virtual host (this file) this
    # value is not decisive as it is used as a last resort host regardless.
    # However, you must set it for any further virtual host explicitly.
    #ServerName www.example.com

    ServerAdmin ralucarusu@localhost
    DocumentRoot /var/www/html
    ServerName www.raluca.example.com

    # Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
    # error, crit, alert, emerg.
    # It is also possible to configure the loglevel for particular
    # modules, e.g.
    #LogLevel info ssl:warn

    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined

    # For most configuration files from conf-available/, which are
    # enabled or disabled at a global level, it is possible to
    # include a line for only one particular virtual host. For example the
    # following line enables the CGI configuration for this host only
    # after it has been globally disabled with "a2disconf".
    #Include conf-available/serve-cgi-bin.conf
</VirtualHost>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet

```

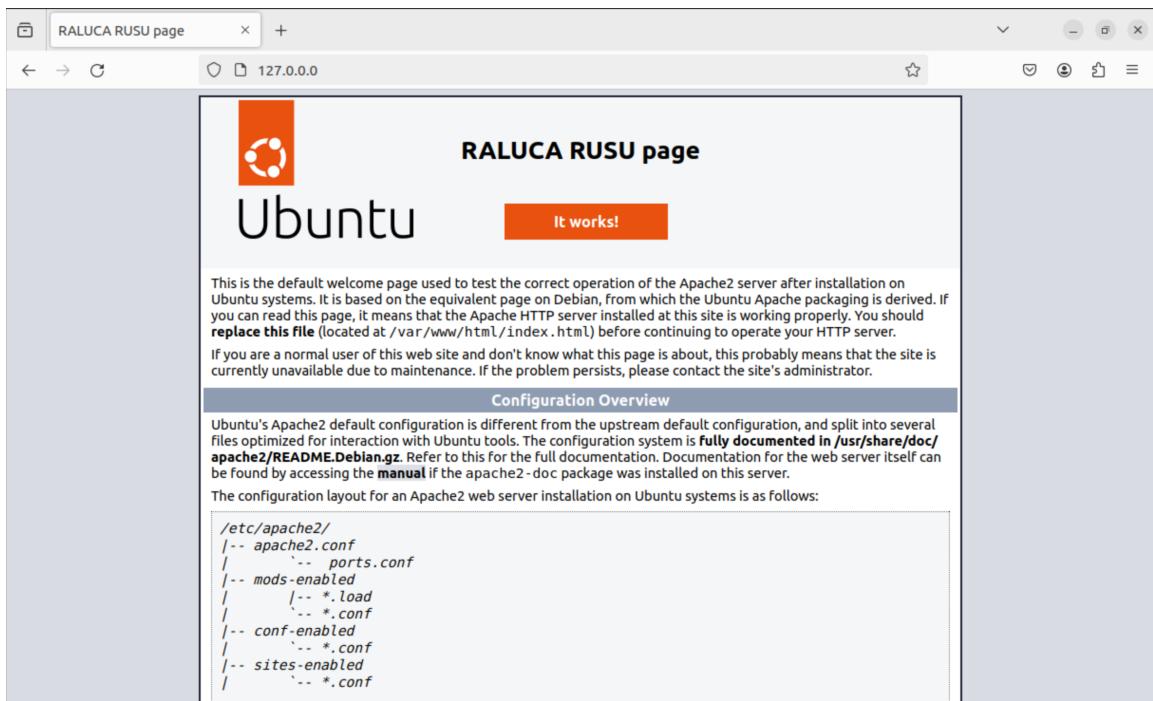
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark
 ^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^I Go To Line M-E Redo M-D Copy

- Enable website first by using the command `sudo a2ensite html.conf` to execute the `a2ensite` script with superuser privileges, enabling the specified Apache site configuration, in this case, `html.conf`. This action makes the specified site available by linking its configuration file from the sites-available directory to the sites-enabled directory, thereby including it in Apache's configuration upon the next reload or restart.

```
ubuntu@ubuntu:/etc/apache2/sites-available$ sudo a2ensite html.conf
Enabling site html.
To activate the new configuration, you need to run:
    systemctl reload apache2
```

```
ubuntu@ubuntu:/etc/apache2/sites-available$ systemctl reload apache2
```

- Then I opened a browser file and served the website:



Security tasks - Firewall

- First I used `sudo ufw status` to display the current status of the UFW (Uncomplicated Firewall), showing whether it's active and listing the current rules that are set. And then `sudo ufw enable` to activate the UFW, enabling the firewall to start filtering packets based on the rules defined.

```

ubuntu@ubuntu:~$ sudo ufw status
Status: inactive
ubuntu@ubuntu:~$ sudo ufw enable
Firewall is active and enabled on system startup

```

- Then I used `sudo ufw allow port/protocol` to
 - `sudo ufw allow ssh` to allow incoming SSH connections by protocol

```

ubuntu@ubuntu:~$ sudo ufw allow ssh
Rule added
Rule added (v6)

```

- `sudo ufw allow 22` explicitly allows incoming traffic on port 22, which is used for SSH direct approach to opening the port for SSH connections, without specifying the protocol

```

ubuntu@ubuntu:~$ sudo ufw allow 22
Rule added
Rule added (v6)

```

FTP

- To install an FTP server on Ubuntu, the simplest method is to use `vsftpd` - an open-source FTP utility commonly used in Ubuntu due to its simplicity.
- I installed `vsftpd` by running `sudo apt install vsftpd`

```
ubuntu@ubuntu:/etc/ssh$ sudo apt install vsftpd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  vsftpd
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 118 kB of archives.
After this operation, 309 kB of additional disk space will be used.
Get:1 http://ports.ubuntu.com/ubuntu-ports jammy/main arm64 vsftpd arm64 3.0.5-0ubuntu1 [118 kB]
Fetched 118 kB in 0s (386 kB/s)
Preconfiguring packages ...
Selecting previously unselected package vsftpd.
(Reading database ... 217425 files and directories currently installed.)
Preparing to unpack .../vsftpd_3.0.5-0ubuntu1_arm64.deb ...
Unpacking vsftpd (3.0.5-0ubuntu1) ...
Setting up vsftpd (3.0.5-0ubuntu1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/vsftpd.service → /lib/systemd/system/vsftpd.service.
Processing triggers for man-db (2.10.2-1) ...
```

- Then to launch the service and enable it to automatically start at boot I used:

```
ubuntu@ubuntu:/etc/ssh$ sudo systemctl start vsftpd
ubuntu@ubuntu:/etc/ssh$ sudo systemctl enable vsftpd
Synchronizing state of vsftpd.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable vsftpd
```

- Before making any changes, I backed up my configuration files:

```
ubuntu@ubuntu:/etc/apache2/sites-available$ sudo cp 000-default.conf html.conf
ubuntu@ubuntu:/etc/apache2/sites-available$ sudo nano html.conf
```

- Then I configured Firewall to Allow FTP Traffic. Since I am using UFW, it is set to block FTP traffic by default. I ran the following commands to open Ports 20 and 21 for FTP traffic:

```
ubuntu@ubuntu:~$ sudo ufw allow 20/tcp
Rule added
Rule added (v6)
ubuntu@ubuntu:~$ sudo ufw allow 21/tcp
Rule added
Rule added (v6)
```

- Then I connected to the FTP server:

```
ubuntu@ubuntu:~$ sudo ftp ubuntu
Connected to ubuntu.
220 (vsFTPd 3.0.5)
Name (ubuntu:ubuntu): ralucarusu
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> 
```

DHCP

- I installed and configured `isc-dhcp-server`, which installs the dynamic host configuration protocol daemon, `dhcpd`.
- To install `isc-dhcp-server` I used `sudo apt install isc-dhcp-server`

```
ubuntu@ubuntu:~$ sudo apt install isc-dhcp-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libirs-export161 libisccfg-export163
Suggested packages:
  isc-dhcp-server-ldap policycoreutils
The following NEW packages will be installed:
  isc-dhcp-server libirs-export161 libisccfg-export163
0 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 519 kB of archives.
After this operation, 1458 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://ports.ubuntu.com/ubuntu-ports jammy/main arm64 libisccfg-export163 arm64 1:9.11.19+dfsg-2.1ubuntu3 [52.4 kB]
Get:2 http://ports.ubuntu.com/ubuntu-ports jammy/main arm64 libirs-export161 arm64 1:9.11.19+dfsg-2.1ubuntu3 [19.5 kB]
Get:3 http://ports.ubuntu.com/ubuntu-ports jammy-updates/main arm64 isc-dhcp-server arm64 4.4.1-2.3ubuntu2.4 [448 kB]
Fetched 519 kB in 1s (805 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libisccfg-export163.
(Reading database ... 217389 files and directories currently installed.)
Preparing to unpack .../libisccfg-export163_1%3a9.11.19+dfsg-2.1ubuntu3_arm64.de
```

- I wanted DHCP server giving clients an IP address from the range `192.168.1.150 - 192.168.1.200`. To lease an IP address for 600 seconds if the client doesn't ask for a specific time frame. Otherwise the maximum (allowed) lease to be 7200 seconds. The server will also "advise" the client to use `192.168.1.254` as the default-gateway and `192.168.1.1` and `192.168.1.2` as its DNS servers.
- To do this I configured the `isc-dhcp-server` by editing `/etc/dhcp/dhcpd.conf` with `sudo nano /etc/dhcp/dhcpd.conf` like this:

```

GNU nano 6.2                               /etc/dhcp/dhcpd.conf
# other clients get addresses on the 10.0.29/24 subnet.

#class "foo" {
#  match if substring (option vendor-class-identifier, 0, 4) = "SUNW";
#}

#shared-network 224-29 {
#  subnet 10.17.224.0 netmask 255.255.255.0 {
#    option routers rtr-224.example.org;
#  }
#  subnet 10.0.29.0 netmask 255.255.255.0 {
#    option routers rtr-29.example.org;
#  }
#  pool {
#    allow members of "foo";
#    range 10.17.224.10 10.17.224.250;
#  }
#  pool {
#    deny members of "foo";
#    range 10.0.29.10 10.0.29.230;
#  }
#}
default lease-time 600;
max-lease-time 7200;

subnet 192.168.1.0 netmask 255.255.255.0 {
range 192.168.1.150 192.168.1.200;
option routers 192.168.1.254;
option domain-name-servers 192.168.1.1, 192.168.1.2;
option domain-name "raluca.example";
}

```

- I also edited `/etc/default/isc-dhcp-server` to specify the interfaces `dhcpd` should listen to with `sudo nano /etc/default/isc-dhcp-server` like this:

```

GNU nano 6.2                               /etc/default/isc-dhcp-server
# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPDV4_CONF=/etc/dhcp/dhcpd.conf
#DHCPDV6_CONF=/etc/dhcp/dhcpd6.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPDV4_PID=/var/run/dhcpd.pid
#DHCPDV6_PID=/var/run/dhcpd6.pid

# Additional options to start dhcpd with.
#       Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""

# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
#       Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACESv4="eth4"
INTERFACESv6=""

```

- Then after changing the config files I just restarted the `dhcpd` service:

```

ubuntu@ubuntu:/etc/default$ sudo systemctl restart isc-dhcp-server.service

```

Administration tasks - Monitoring

- `htop` is an interactive process viewer for Unix systems, offering a more user-friendly and visually appealing way to monitor system processes than

the traditional `top` command. It provides a dynamic real-time view of a running system, including CPU and memory usage, process tree, and more.

- I installed it with the command `sudo apt install htop`.

```
ubuntu@ubuntu:~$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  lm-sensors
The following NEW packages will be installed:
  htop
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 127 kB of archives.
After this operation, 329 kB of additional disk space will be used.
Get:1 http://ports.ubuntu.com/ubuntu-ports jammy/main arm64 htop arm64 3.0.5-7bu
ild2 [127 kB]
Fetched 127 kB in 1s (236 kB/s)
Selecting previously unselected package htop.
(Reading database ... 217379 files and directories currently installed.)
Preparing to unpack .../htop_3.0.5-7build2_arm64.deb ...
Unpacking htop (3.0.5-7build2) ...
Setting up htop (3.0.5-7build2) ...
```

- Then I ran it with the command `htop`. This launched the `htop` interactive process viewer. Unlike the traditional `top` command, `htop` allows you to scroll vertically to view all processes running on the system, and horizontally to view their full command lines. It provides a colorful and graphical display of the system's current state, including CPU, memory, and swap usage, as well as a list of processes or threads currently being managed by the kernel.

```
ubuntu@ubuntu:~$ htop
[4] 1.3% Tasks: 157, 341 thr; 1 running
[1] 1.3% Load average: 0.06 0.17 0.08
Mem[|||||] 2.30G/3.81G Uptime: 03:13:51
Swp[OK/OK]

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
1697 ubuntu 20 0 4203M 383M 145M S 1.3 9.8 5:53.99 /usr/bin/gnome-shell
12845 mysql 20 0 1740M 383M 34048 S 1.3 9.8 1:26.54 /usr/sbin/mysqld
20183 ubuntu 20 0 19752 3840 2560 R 1.3 0.1 0:00.17 htop
1708 ubuntu 20 0 4203M 383M 145M S 0.7 9.8 1:55.03 /usr/bin/gnome-shell
12863 mysql 20 0 1740M 383M 34048 S 0.7 9.8 0:48.54 /usr/sbin/mysqld
12867 mysql 20 0 1740M 383M 34048 S 0.7 9.8 0:01.66 /usr/sbin/mysqld
1 root 20 0 164M 11600 7504 S 0.0 0.3 0:08.03 /sbin/init ...
842 root 19 -1 81444 14508 12972 S 0.0 0.4 0:02.48 /lib/systemd/systemd-journald
868 root 20 0 27068 6784 4096 S 0.0 0.2 0:00.69 /lib/systemd/systemd-udevd
1071 systemd-o 20 0 14992 6272 5504 S 0.0 0.2 0:33.41 /lib/systemd/systemd-oomd
1072 systemd-r 20 0 25340 12988 8704 S 0.0 0.3 0:01.84 /lib/systemd/systemd-resolved
1074 systemd-t 20 0 88732 6528 5760 S 0.0 0.2 0:00.86 /lib/systemd/systemd-timesyncd
1092 systemd-t 20 0 88732 6528 5760 S 0.0 0.2 0:00.00 /lib/systemd/systemd-timesyncd
1282 avahi 20 0 7964 3456 3072 S 0.0 0.1 0:01.64 avahi-daemon: running [ubuntu.local]
1283 messagebu 20 0 11376 6016 3712 S 0.0 0.2 0:02.64 @dbus-daemon --system --address=systemd: --nofork --nopid
1285 root 20 0 337M 17336 14392 S 0.0 0.4 0:07.38 /usr/sbin/NetworkManager --no-daemon
1289 root 20 0 82080 3200 2816 S 0.0 0.1 0:04.40 /usr/sbin/irqbalance --foreground
1290 root 20 0 50664 19712 10496 S 0.0 0.5 0:00.13 /usr/bin/python3 /usr/bin/networkd-dispatcher --run-start
1291 root 20 0 231M 9976 6448 S 0.0 0.2 0:01.10 /usr/libexec/polkitd --no-debug
F1?help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice +F8Nice +F9Kill F10Quit
```

