



NTWK8141



Student Name	Harshul Shukla (Section 2)
Student ID	8986048
Deliverable	NTWK8141-Practical Assignment 2
Date Assigned	05 Nov 2024
Date Due	24 Nov 2024
Rules	<ul style="list-style-type: none">• Individual.• Cheating is not allowed.• Plagiarism counts as cheating! <p>That FAILURE to submit work in the course can result in a grade of 'F' or 'I' for failure to complete the course!</p>

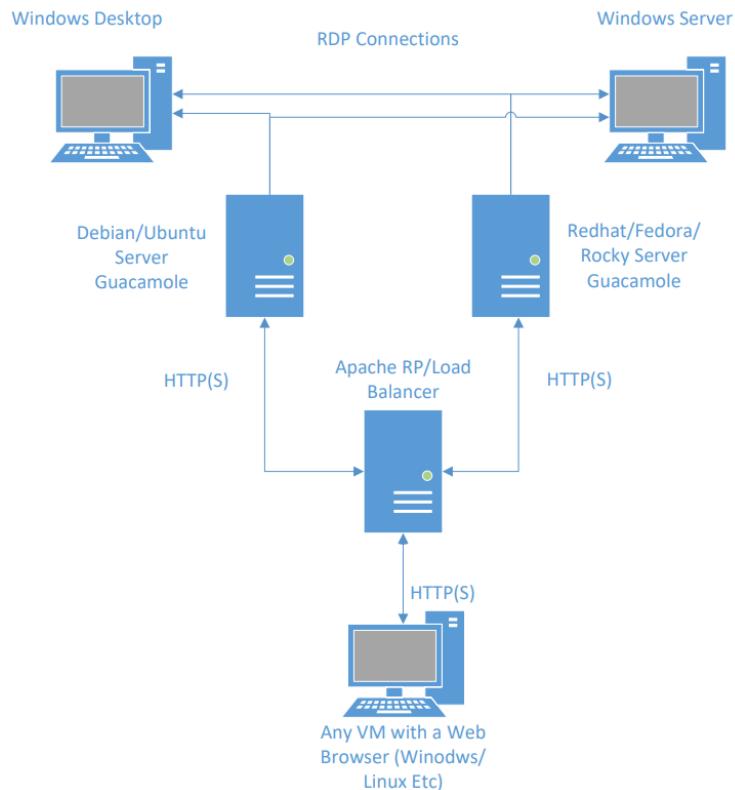
Contents

1. Introduction and Objectives	3
2. Windows Server (DC) Setup	4
3. Windows Client Setup	5
4. Steps to Join a Linux System to a Domain.....	6
5. Linux Client (SSH, SCP).....	7
6. Configuring Guacamole in Ubuntu	8
7. Configuring Guacamole in Rocky Linux.....	14
8.Loadballancer and Reverse Proxy.....	24

1. Introduction and Objectives

- **Windows DC:** A Windows Server acting as Domain Controller
- **Windows Client:** A Windows client machine configured to connect to DC using Remote Desktop Protocol
- **Linux Servers and Client:** Three Linux servers and one client (Optional) to be added to Windows domain
- **Guacamole Setup:** Deploy Guacamole on Ubuntu and Fedora servers for remote desktop access
- **Customization:** Modify Guacamole web page titles to show their OS
- **Load Balancer:** Set up load balancer to distribute traffic between Guacamole instances
- **Reverse proxy:** Set up reverse proxy for load balancer

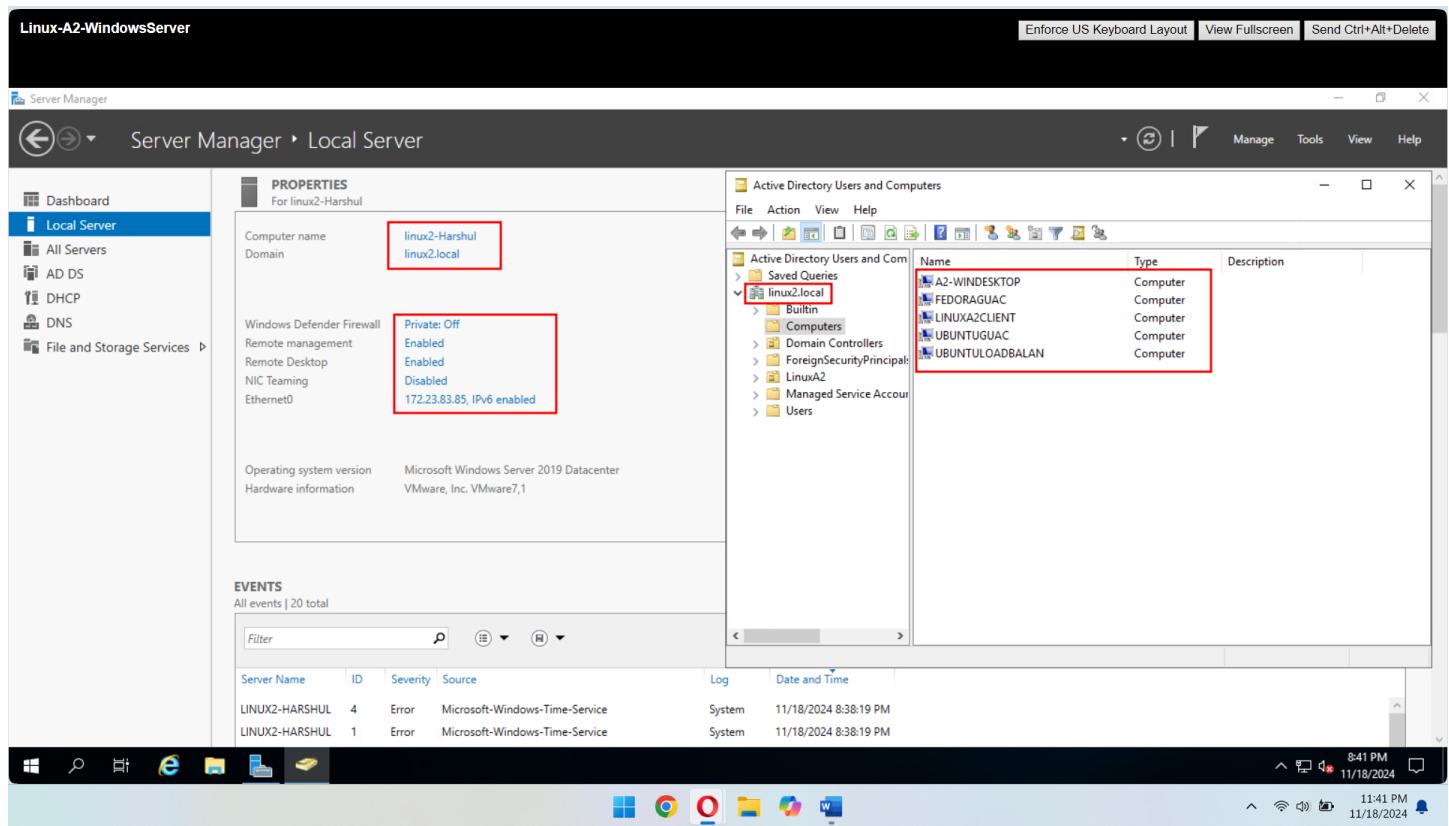
Component	IP Address	Role
Windows Server	172.23.83.85	Domain Controller (DC) for Linux2.local
Windows Client	172.23.83.86	RDP connection via Guacamole
Linux Client	172.23.83.21	SSH , SCP to servers, joined to domain
Ubuntu Server	172.23.83.87	Ubuntu-Guacamole server with usermapping.xml
Fedora Server	172.23.83.111	Rocky Linux ,Guacamole server with LDAP
Load Balancer	172.23.83.88	Apache reverse proxy with load balancing



2. Windows Server (DC) Setup

Configure the Domain and Enable RDP

1. Log in to the Windows Server.
2. Open Server Manager and install Active Directory Domain Services (AD DS) and DNS Server.
3. Promote server to a Domain Controller(DC) - Domain Name: **Linux2.local**.
4. Check if DNS is correctly configured to resolve hostnames in domain
5. Make sure remote desktop is enabled for RDP.



NOTE :

Check that all virtual machines have enough resources to operate so we are giving the following specs for each VM

- **Memory:** 3 GB
- **CPU:** 4 cores
- **Hard Drive:** 90 GB

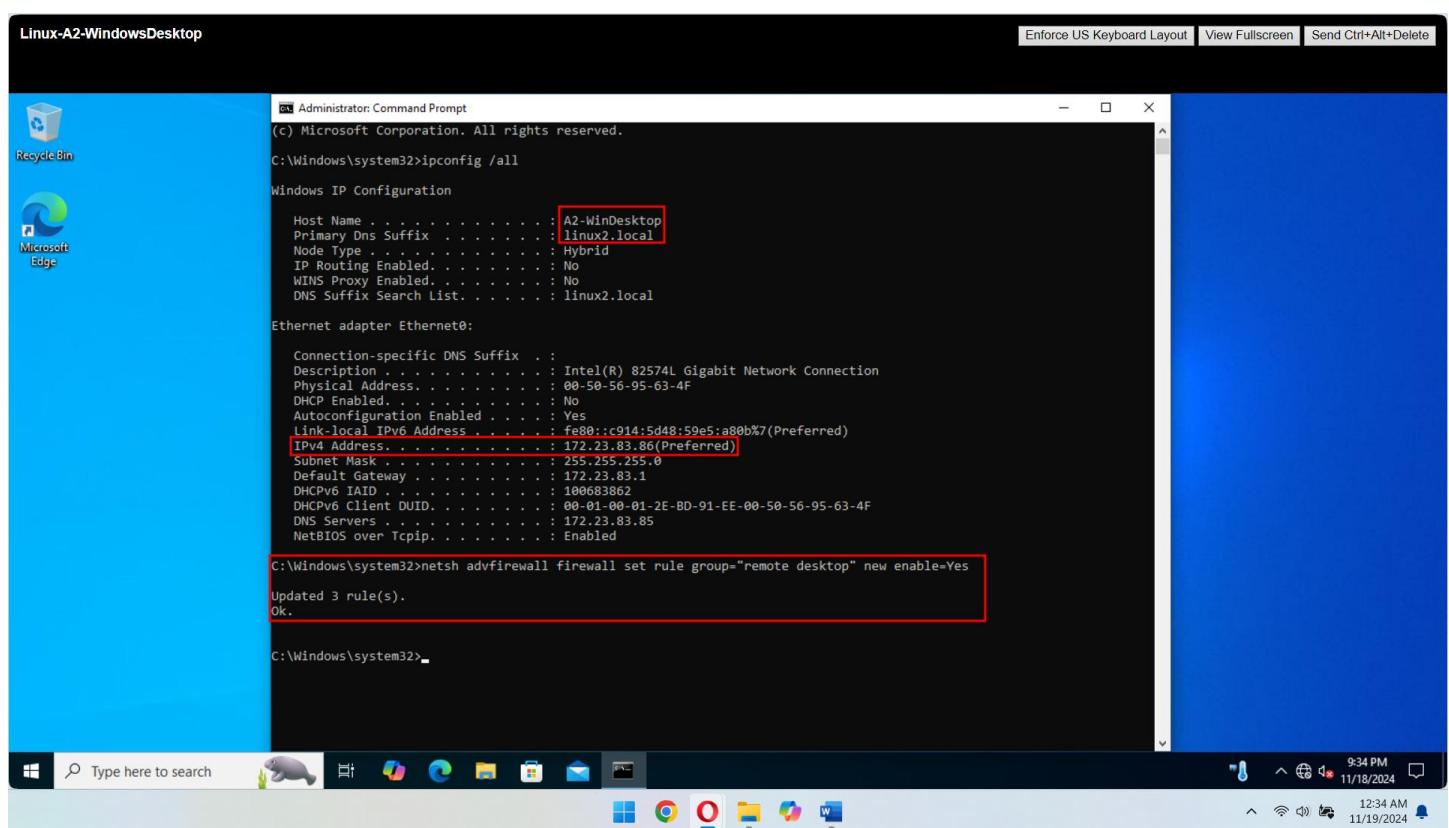
3. Windows Client Setup

Step 1: Join the Domain

1. Open Control Panel > System > Change Settings.
2. Under the Computer Name tab, click Change.
3. Enter the domain name: **Linux2.local**.
4. Provide the domain administrator credentials to join the domain.

Step 2: Enable RDP

1. Open Control Panel > System and Security > System > Remote Settings.
2. Under **Remote Desktop**, select
"Allow remote connections to this computer."
"Allow connections only from computers running Remote Desktop with Network Level Authentication."
3. Open the firewall to allow RDP traffic: Go to cmd and enter "**netsh advfirewall firewall set rule group="remote desktop" new enable=Yes**"



```

Administrator: Command Prompt
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>ipconfig /all

Windows IP Configuration

Host Name . . . . . : A2-WinDesktop
Primary Dns Suffix . . . . . : linux2.local
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : linux2.local

Ethernet adapter Ethernet0:

    Connection-specific DNS Suffix . :
    Description . . . . . : Intel(R) 82574L Gigabit Network Connection
    Physical Address . . . . . : 00-50-56-95-63-4F
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::c914:5d48:59e5:a80b%7(Preferred)
    IPv4 Address. . . . . : 172.23.83.86(Preferred)
        Subnet Mask . . . . . : 255.255.255.0
        Default Gateway . . . . . : 172.23.83.1
        DHCPv6 IID . . . . . : 100683862
        DHCPv6 Client DUID . . . . . : 00-01-00-01-2E-BD-91-EE-00-50-56-95-63-4F
        DNS Servers . . . . . : 172.23.83.85
        NetBIOS over Tcpip. . . . . : Enabled

C:\Windows\system32>netsh advfirewall firewall set rule group="remote desktop" new enable=Yes
Updated 3 rule(s).
Ok.

C:\Windows\system32>

```

4. Steps to Join a Linux System to a Domain

Update Package Manager

```
sudo apt update
```

Install the packages needed for domain joining and authentication

```
sudo apt -y install realmd libnss-sss libpam-sss sssd sssd-tools adcli samba-common-bin oddjob oddjob-mkhomedir
```

Install Kerberos User Tools

```
sudo apt install krb5-user
```

Set Hostname

```
sudo hostnamectl set-hostname linux-Harshul.Linux2.local
```

Disable and Stop systemd-resolved

```
sudo systemctl disable systemd-resolved
```

```
sudo systemctl stop systemd-resolved
```

Edit DNS Resolver Configuration

Update the /etc/resolv.conf file with the domain's DNS server details:

```
sudo nano /etc/resolv.conf
```

Add the following lines:

```
nameserver 172.23.83.85
```

```
options edns0 trust-ad
```

```
search Linux2.local
```

Authenticate as Domain Administrator

Use kinit to authenticate with Kerberos:

```
sudo kinit Administrator@LINUX2.LOCAL
```

Join the Domain

Execute the realm command to join the domain:

```
sudo realm join -U Administrator LINUX2.LOCAL
```

Check

```
Realm list
```

Note: Use dnf instead of apt for fedora/red hat-based systems.

5. Linux Client (SSH, SCP)

Step 1: Install and Configure SSH

The same package installs both SSH and SCP

Install the SSH server on the Linux client

```
sudo apt update && sudo apt install -y openssh-server
```

Ensure the SSH service is running

```
sudo systemctl enable ssh
```

```
sudo systemctl start ssh
```

Allow SSH through the firewall

```
sudo ufw allow ssh
```

The screenshot shows a terminal window titled "Linux-A2-LinuxMintClient" with a black background. The terminal output is as follows:

```
File Edit View Search Terminal Help
harshul@linuxA2Client:~$ sudo apt install openssh-client
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-client is already the newest version (1:8.9p1-3ubuntu0.10).
0 upgraded, 0 newly installed, 0 to remove and 18 not upgraded.
harshul@linuxA2Client:~$ sudo ufw allow ssh
Skipping adding existing rule
Skipping adding existing rule (v6)
harshul@linuxA2Client:~$ systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2024-11-18 23:29:10 EST; 1h 28min ago
     Docs: man:sshd(8)
           man:sshd config(5)
   Process: 875 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
 Main PID: 885 (sshd)
    Tasks: 1 (limit: 4545)
   Memory: 3.4M
      CPU: 21ms
     Group: /system.slice/ssh.service
        ▾ 885 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Nov 18 23:29:09 linuxA2Client.Linux2.local systemd[1]: Starting OpenBSD Secure Shell server...
Nov 18 23:29:10 linuxA2Client.Linux2.local sshd[885]: Server listening on 0.0.0.0 port 22.
Nov 18 23:29:10 linuxA2Client.Linux2.local sshd[885]: Server listening on :: port 22.
Nov 18 23:29:10 linuxA2Client.Linux2.local systemd[1]: Started OpenBSD Secure Shell server.
harshul@linuxA2Client:~$ realm list
linux2.local
  type: kerberos
  realm-name: LINUX2.LOCAL
  domain-name: linux2.local
  configured: kerberos-member
  server-software: active-directory
  client-software: sssd
  required-package: ssd-tools
  required-package: sssd
  required-package: libnss-sss
  required-package: libpam-sss
```

The terminal window has a red box highlighting the command "sudo apt install openssh-client". Another red box highlights the command "sudo ufw allow ssh". A third red box highlights the command "realm list". The bottom right corner of the terminal window shows the system tray with icons for battery, signal, and time (12:59 AM, 11/19/2024).

6. Configuring Guacamole in Ubuntu

Once you join the domain Linux2.local , we can proceed with the configuring the Guacamole in ubuntu server, make sure to follow the steps:

Make sure to update and install all necessary packages and dependencies:

Update Package Lists: sudo apt update

Upgrade Installed Packages: sudo apt upgrade

Install Required Dependencies:

```
sudo apt install build-essential libcairo2-dev libjpeg-turbo8-dev libpng-dev libtool-bin libossp-uuid-dev  
libvncserver-dev freerdp2-dev libssh2-1-dev libtelnet-dev libwebsockets-dev libpulse-dev libvorbis-dev  
libwebrtc-dev libssl-dev libpangol.0-dev libswscale-dev libavcodec-dev libavutil-dev libavformat-dev -y
```

Download the tar file directly or download from linux client and send via SSH and proceed to unzip it

Ssh guacamole-server-1.4.0.tar harshul@172.23.83.87:~

Once Download is complete Unzip the file and go to that folder and then we can install and proceed.

Extract the Tar File: tar -xvf guacamole-server-1.4.0.tar.gz

Navigate to the Extracted Directory: cd guacamole-server-1.4.0/

Configure the Build Environment: ./configure --with-init-dir=/etc/init.d

Compile the Source Code: sudo make

Install Guacamole Server: sudo make install

Updating system cache

Update System Cache: sudo ldconfig

Reload Systemd Daemon: sudo systemctl daemon-reload

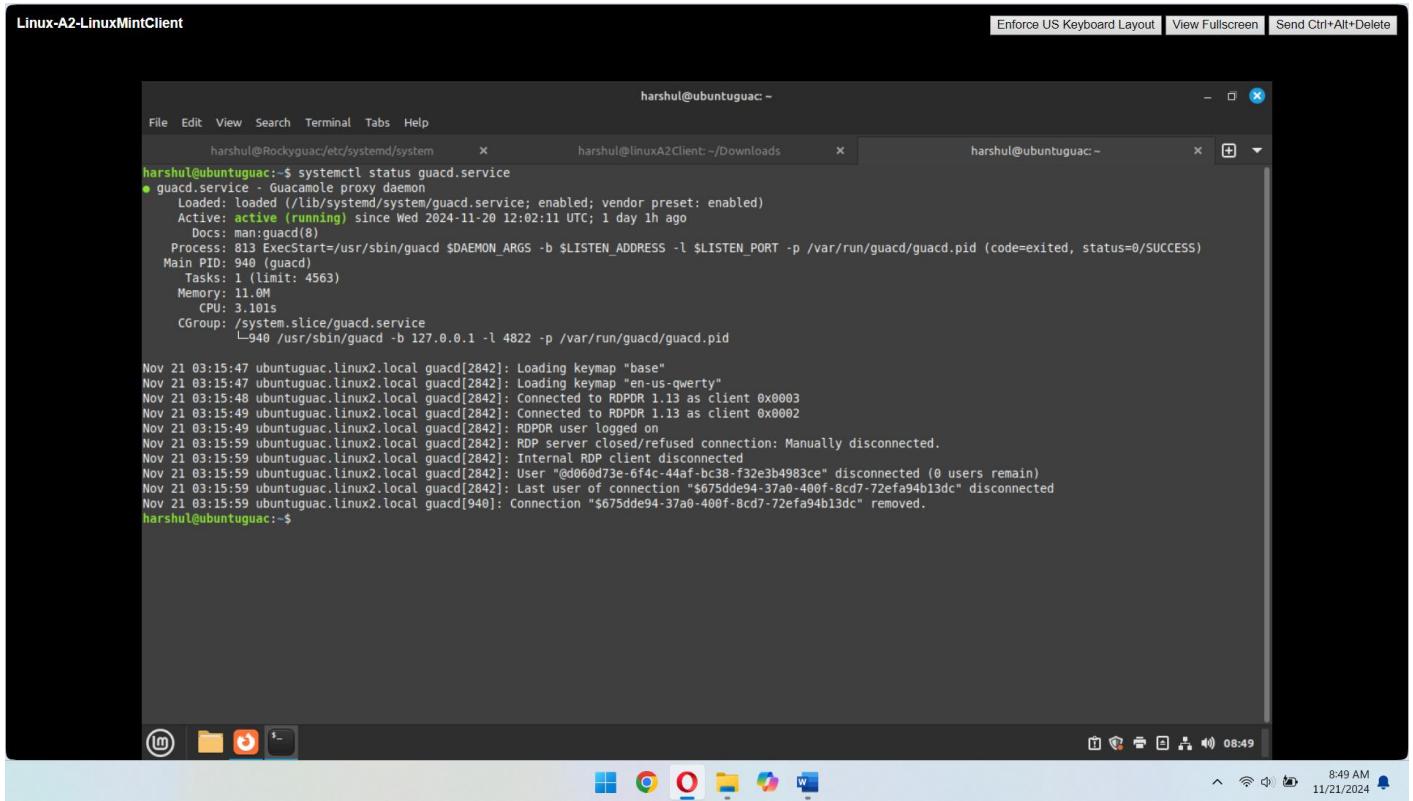
Enable Guacamole Daemon guacd to Start at Boot: sudo systemctl enable guacd

Start Guacamole Daemon: sudo systemctl start guacd

Note: Make sure all the dependencies are installed correctly and not missing anything for guacamole to run properly.

Verify status

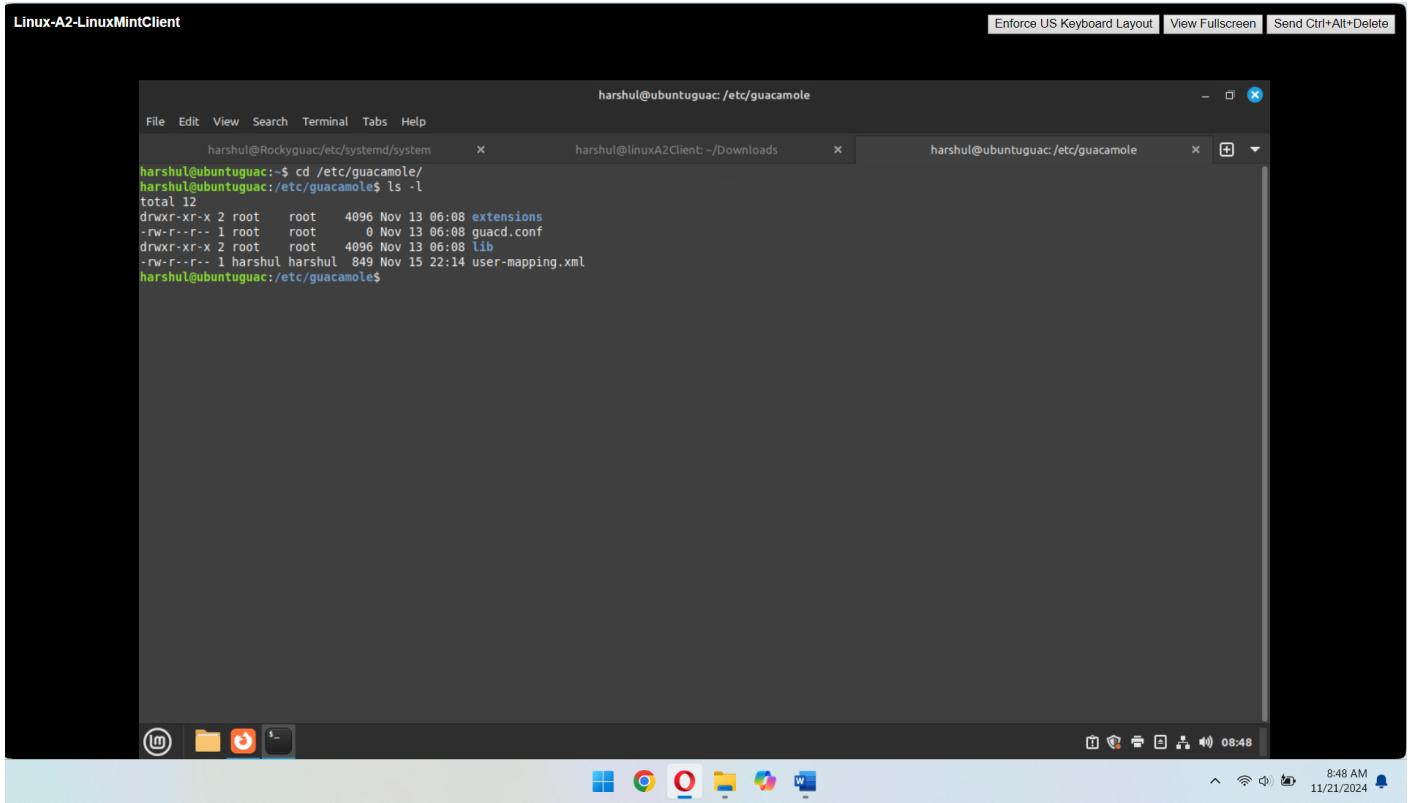
sudo systemctl status guacd



```
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:/etc/systemd/system x harshul@linuxA2Client:~/Downloads x harshul@ubuntuguac:~ x
harshul@ubuntuguac:~$ systemctl status guacd.service
● guacd.service - Guacamole proxy daemon
   Loaded: loaded (/lib/systemd/system/guacd.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2024-11-20 12:02:11 UTC; 1 day 1h ago
       Docs: man:guacd(8)
   Process: 813 ExecStart=/usr/sbin/guacd $@EAMON_ARGS -b $LISTEN_ADDRESS -l $LISTEN_PORT -p /var/run/guacd/guacd.pid (code=exited, status=0/SUCCESS)
 Main PID: 940 (guacd)
    Tasks: 1 (limit: 4563)
      Memory: 11.6M
        CPU: 3.101s
       CGroup: /system.slice/guacd.service
               └─ 940 /usr/sbin/guacd -b 127.0.0.1 -l 4822 -p /var/run/guacd/guacd.pid

Nov 21 03:15:47 ubuntuguac.linux2.local guacd[2842]: Loading keymap "base"
Nov 21 03:15:47 ubuntuguac.linux2.local guacd[2842]: Loading keymap "en-us-qwerty"
Nov 21 03:15:48 ubuntuguac.linux2.local guacd[2842]: Connected to RDPDR 1.13 as client 0x0003
Nov 21 03:15:49 ubuntuguac.linux2.local guacd[2842]: Connected to RDPDR 1.13 as client 0x0002
Nov 21 03:15:49 ubuntuguac.linux2.local guacd[2842]: RDPDR user logged on
Nov 21 03:15:59 ubuntuguac.linux2.local guacd[2842]: RDP server closed/refused connection: Manually disconnected.
Nov 21 03:15:59 ubuntuguac.linux2.local guacd[2842]: Internal RDP client disconnected
Nov 21 03:15:59 ubuntuguac.linux2.local guacd[2842]: User "@0000d73e-6f4c-44af-bc38-f32e3b4983ce" disconnected (0 users remain)
Nov 21 03:15:59 ubuntuguac.linux2.local guacd[2842]: Last user of connection "$675dde94-37a0-400f-8cd7-72efa94b13dc" disconnected
Nov 21 03:15:59 ubuntuguac.linux2.local guacd[940]: Connection "$675dde94-37a0-400f-8cd7-72efa94b13dc" removed.
harshul@ubuntuguac:~$
```

Files configurations : We need to create /etc/guacamole and two more directories called lib and extensions



```
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:/etc/systemd/system x harshul@linuxA2Client:~/Downloads x harshul@ubuntuguac:/etc/guacamole x
harshul@ubuntuguac:~$ cd /etc/guacamole/
harshul@ubuntuguac:/etc/guacamole$ ls -l
total 12
drwxr-xr-x 2 root root 4096 Nov 13 06:08 extensions
-rw-r--r-- 1 root root 0 Nov 13 06:08 guacd.conf
drwxr-xr-x 2 root root 4096 Nov 13 06:08 lib
-rw-r--r-- 1 harshul harshul 849 Nov 15 22:14 user-mapping.xml
harshul@ubuntuguac:/etc/guacamole$
```

Configuring User-Mapping for Guacamole on Ubuntu

/etc/guacamole.properties file Will be updated

Open guacamole.properties : sudo nano guacamole.properties and enter the following as shown in image.

```
GNU nano 6.2
guacd-hostname: localhost
guacd-port: 4822
auth-provider: org.apache.guacamole.auth.xml.XMLAuthenticationProvider
```

Update user-mapping.xml

sudo nano /etc/guacamole/user-mapping.xml

Enter the username, password, connection name, protocol, and port details without any mistakes or extra spaces. Follow the below image for proper configurations.

After entering details, save file by entering Ctrl + O

Exit with Ctrl + X.

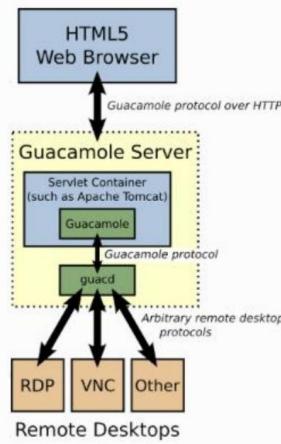
After updating configuration files, restart Guacamole service to apply changes

sudo systemctl restart guacd

```
<user-mapping>
  <authorize username="harshul" password="Secret55!">
    <connection name="Windows Client(From Ubuntu)">
      <protocol rdp/>
      <param name="hostname">172.23.83.86</param>
      <param name="port">3389</param>
      <param name="username">administrator</param>
      <param name="password">Secret55!</param>
      <param name="ignore-cert">true</param>
    </connection>
    <connection name="Windows Server(From Ubuntu)">
      <protocol rdp/>
      <param name="hostname">172.23.83.85</param>
      <param name="port">3389</param>
      <param name="username">administrator</param>
      <param name="password">Secret55!</param>
      <param name="ignore-cert">true</param>
    </connection>
  </authorize>
</user-mapping>
```

Apache Tomcat

Guacamole service require web application to run, we are using Apache Tomcat.



Steps to Install Apache Tomcat in Ubuntu:

Install OpenJDK and Apache Tomcat

```
sudo apt install openjdk-11-jdk tomcat9 tomcat9-admin tomcat9-common tomcat9-user
```

Download Guacamole.war file from website and SCP to the server just like previous file.

Transfer the File via SCP: Scp Guacamole-1.4.0.war harshul@172.23.83.87:~

Then move the file : sudo mv guacamole-1.4.0.war /var/lib/tomcat9/webapps/guacamole.war

Check to make sure it works : Sudo systemctl status tomcat9.service

Linux-A2-LinuxMintClient

Linux-A2-LinuxMintClient

Enforce US Keyboard Layout View Fullscreen Send Ctrl+Alt+Delete

```
harshul@ubuntuguac:/etc
```

File Edit View Search Terminal Tabs Help

harshul@Rockyguac/etc/systemd/system x harshul@ubuntuguac:~/Downloads x harshul@ubuntuguac/etc x

```
cron.daily          gss           locale.alias      network        python3.10
cron.hourly         guacamole       locale.gen       networkd-dispatcher rc0.d
cron.monthly        guacamole.properties  localtime      NetworkManager   rc8.d
cron.tab            hdparm.conf    logcheck        networks       rc1.d
cronn_weekly        host.conf     login.defs     nftables.conf  rc2.d
cryptsetup-intramfs hostname      logrotate.conf  nmh           rc3.d
crypttab            hosts         logrotate.d    nsswitch.conf rc4.d
dbus-1              hosts.allow   lsb-release    oddjobd.conf  rc5.d
debcfg.conf         hosts.deny   lvm             sudoers.d    rc6.d
harshul@ubuntuguac:~/.etc$ sudo nano guacamole.properties
harshul@ubuntuguac:~/.etc$ sudo systemctl status tomcat
[sudo] password for harshul:
Unit tomcat.service could not be found.
harshul@ubuntuguac:~/.etc$ sudo systemctl status tomcat9.service
● tomcat9.service - Apache Tomcat 9 Web Application Server
   Loaded: loaded (/lib/systemd/system/tomcat9.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2024-11-20 12:02:10 UTC; 1 day 3h ago
     Docs: https://tomcat.apache.org/tomcat-9.0-doc/index.html
   Process: 834 ExecStartPre=/usr/libexec/tomcat9/tomcat-update-policy.sh (code=exited, status=0/SUCCESS)
 Main PID: 872 (java)
   Tasks: 39 (limit: 4563)
  Memory: 296.7M
    CPU: 2min 43.09s
   CGroup: /system.slice/tomcat9.service
           └─872 /usr/lib/jvm/default-java/bin/java -Djava.util.logging.config.file=/var/lib/tomcat9/conf/logging.properties -Djava.util.logging.manager=org

Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: Exception in thread "Thread-15" 14:29:55.395 [http-nio-8080-exec-9] INFO o.a.g.tunnel.TunnelRequestSer...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: java.lang.IllegalStateException: Message will not be sent because the WebSocket session has been closed
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.writeMessagePart(WsRemoteEndpointImplBase...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendMessageBlock(WsRemoteEndpointImplBase...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendMessageBlock(WsRemoteEndpointImplBase...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendString(WsRemoteEndpointImplBase.java:...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.tomcat.websocket.WsRemoteEndpointBasic.sendText(WsRemoteEndpointBasic.java:37)
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.guacamole.websocket.GuacamoleWebSocketTunnelEndpoint.sendInstruction(GuacamoleWeb...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.guacamole.websocket.GuacamoleWebSocketTunnelEndpoint.access$200(GuacamoleWebSock...
Nov 21 14:29:55 ubuntuguac.linux2.local tomcat9[872]: at org.apache.guacamole.websocket.GuacamoleWebSocketTunnelEndpoint$2.run(GuacamoleWebSoc...
Lines 1-22/22 (END)
```

Changing the Web Page Appearance for Guacamole

Next step is to change the way Web page looks to differentiate between ubuntu and Rocky linux login page , so we will be making small change to make it look different. We will change en.json

Navigate to the Webapps Directory: cd /var/lib/tomcat/webapps/

Change Ownership of Guacamole Directory: sudo chown harshul:harshul guacamole

Change Ownership of Translations Directory: sudo chown harshul:harshul translations.

Modify en.json: Open the en.jsonFile: sudo nano /var/lib/tomcat9/websapp/guacamole/translations/en.json

open the file and change the name as shown in below image **New name : Harshul Ubuntu-Guacamole**

Save and Exit: ctrl + o , ctrl + x

```

Linux-A2-LinuxMintClient
root@ubuntuguac: /var/lib/tomcat9/webapps/guacamole/translations
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:/etc/systemd/system x root@ubuntuguac: /var/lib/tomcat9/webapps/guacamole... x
GNU nano 6.2 en.json
"NAME" : "English",
"APP" : {
    "NAME" : "Harshul Ubuntu-Guacamole",
    "VERSION" : "1.4.0",
    "ACTION_ACKNOWLEDGE" : "OK",
    "ACTION_CANCEL" : "Cancel",
    "ACTION_CLONE" : "Clone",
    "ACTION_CONTINUE" : "Continue",
    "ACTION_DELETE" : "Delete",
    "ACTION_DELETE_SESSIONS" : "Kill Sessions",
    "ACTION_DOWNLOAD" : "Download",
    "ACTION_LOGIN" : "Login",
    "ACTION_LOGIN AGAIN" : "Re-login",
    "ACTION_LOGOUT" : "Logout",
    "ACTION_MANAGE_CONNECTIONS" : "Connections",
    "ACTION_MANAGE_PREFERENCES" : "Preferences",
    "ACTION_MANAGE_SETTINGS" : "Settings",
    "ACTION_MANAGE_SESSIONS" : "Active Sessions",
    "ACTION_MANAGE_USERS" : "Users",
    "ACTION_MANAGE_USER_GROUPS" : "Groups",
    "ACTION_NAVIGATE_BACK" : "Back",
    "ACTION_NAVIGATE_HOME" : "Home",
    "ACTION_SAVE" : "Save",
    "ACTION_SEARCH" : "Search",
    "ACTION_SHARE" : "Share",
    "ACTION_UPDATE_PASSWORD" : "Update Password",
    "ACTION_VIEW_HISTORY" : "History",
}
[G Help ^O Write Out ^W Where Is ^K Cut ^R Replace [ Read 1029 lines ] ^X Exit ^R Read File ^C Location M-U Undo M-A Set Mark M-B To Bracket
^U Paste ^J Justify ^G Go To Line M-E Redo M-D Copy ^Q Where Was
[ 10:43 AM 11/21/2024

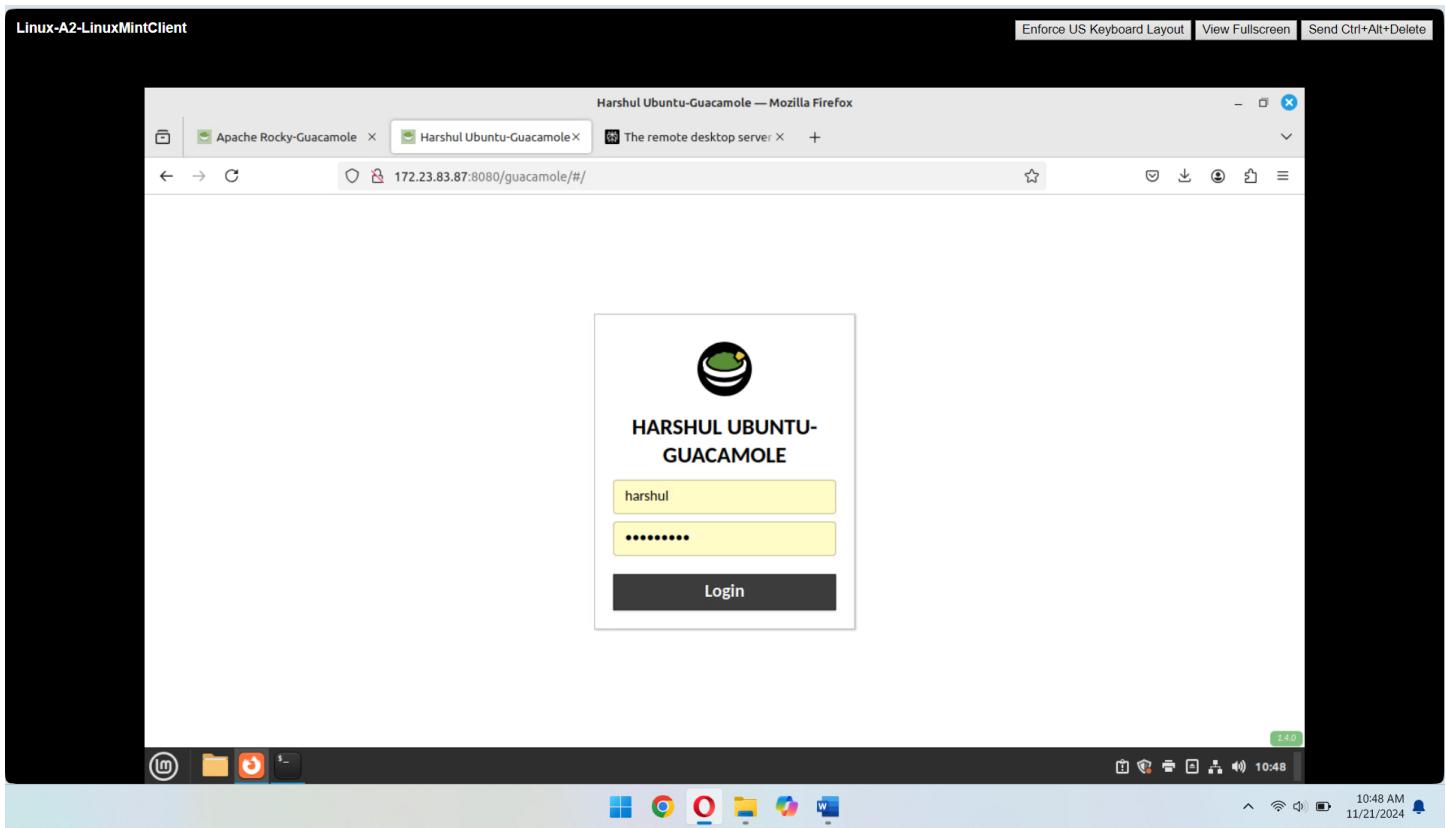
```

Restore Original Permissions

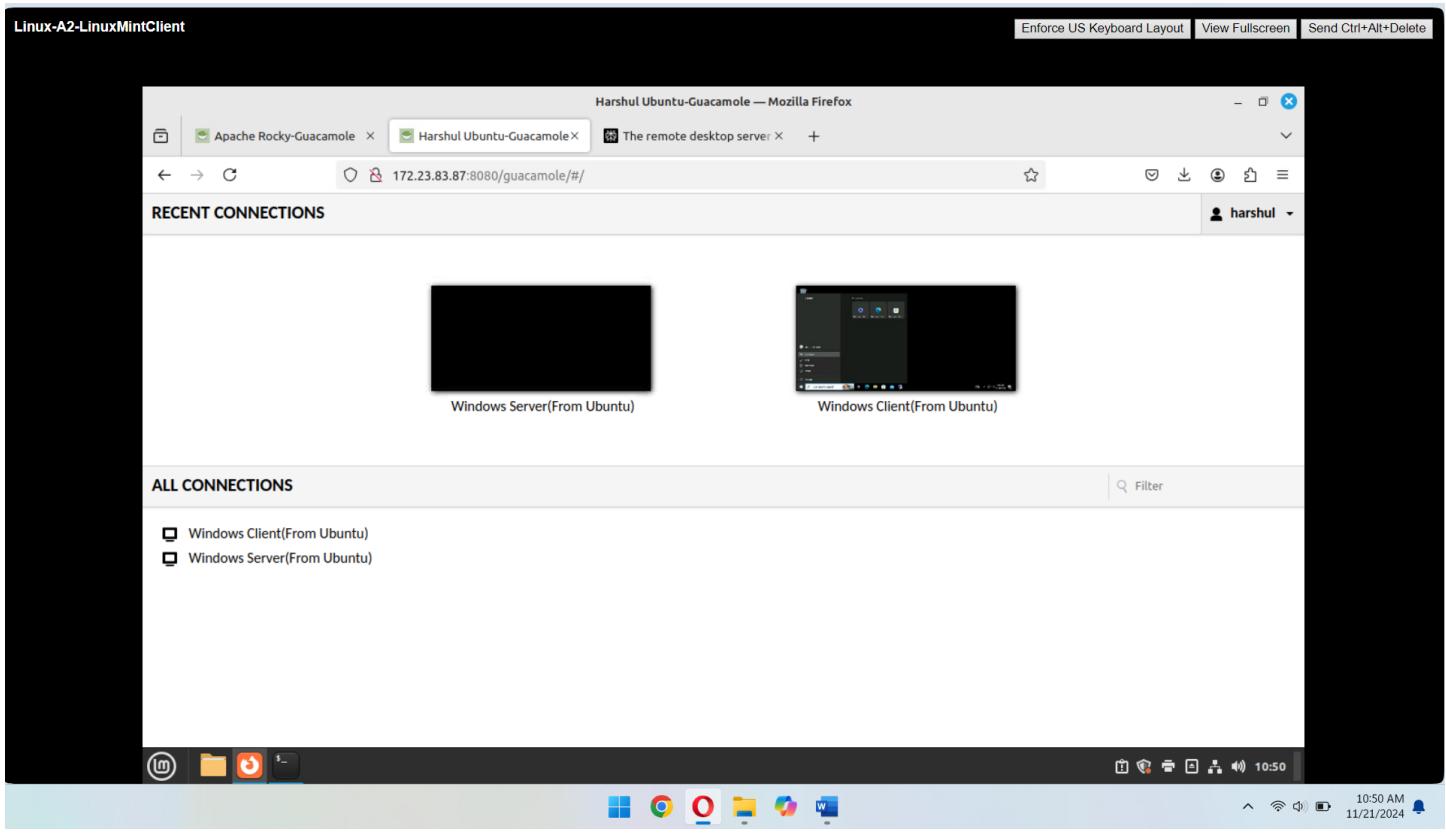
Change Ownership Back to tomcat:tomcat: sudo chown tomcat:tomcat guacamole

For the Translations directory: sudo chown tomcat:tomcat translations

Login to the Guacamole to check the connection , using IP of ubuntu server as shown below.



Once we log in we will be able to Do RDP for both Desktop as well as Server using Guacamole from Ubuntu as shown.



7. Configuring Guacamole in Rocky Linux

We will be using similar set up but instead of XML file we will be doing LDAP configurations from this machine

Install Necessary Packages:

```
sudo dnf install -y gcc glibc-devel mariadb mariadb-devel mariadb-server openssl-devel freerdp freerdp-devel
pango-devel libssh2-devel libtelnet-devel libvncserver-devel libjpeg-turbo-devel libpng-devel uuid-devel
tomcat tomcat-admin-webapp tomcat-webapps.
```

Enable Code Ready Builder Repository: sudo dnf config-manager –set-enabled crb

We can download the file from client browser and SCP it to the server just like we did for ubuntu
 scp guacamole-server-1.5.5.tar.gz 172.23.83.111:

Extract the TAR File: tar -xvf guacamole-server-1.5.5.tar.gz.

Go in to the extracted directory: cd guacamole-server-1.5.5/

configure and compilation: ./configure --with-init-dir=/etc/init.d

check that dependencies are met. You should see protocol support like:

Protocol support:

```
Kubernetes ... yes
RDP ..... Yes
SSH ..... Yes
Telnet ..... Yes
VNC ..... Yes
```

Compile and Install Guacamole Server

Compile the Source Code

sudo make

Install Guacamole Server

sudo make install

Updating system cache

sudo ldconfig

Create and Configure guacd.service

Manually Creating guacd.service file

sudo nano /etc/systemd/system/guacd.service

Add the following lines as shown in image inside the file

The screenshot shows a Linux desktop environment with several open windows. At the top, there's a system tray with icons for network, battery, and date/time (11:37 AM, 11/21/2024). The main window is a terminal session titled "harshul@Rockyguac:/etc/systemd/system". It contains the configuration file for the guacd service, which is a Guacamole proxy daemon. The file includes sections for [Unit], [Service], and [Install]. The [Service] section specifies User=root, Group=root, Type=simple, ExecStart=/usr/local/sbin/guacd -f, and Restart=on-failure. The [Install] section specifies WantedBy=multi-user.target. The terminal window has a dark background and white text. Below the terminal are several other windows, including one titled "GNU nano 5.6.1" showing the same configuration file content, and others for "harshul@linuxA2Client: ~/Downloads" and "harshul@ubuntuguac: ~". The bottom of the screen features a dock with various application icons, including a terminal icon, a file manager, and a browser. A menu bar at the very bottom includes options like Help, Write Out, Where Is, Cut, Paste, Execute, Location, Undo, Redo, Set Mark, To Bracket, Exit, Read File, Replace, Justify, Read 13 lines, and Go To Line.

Reload and enable the services

Reload Systemd Daemon: sudo systemctl daemon-reload

Enable guacd to Start at Boot: sudo systemctl enable guacd.service

Start guacd Service: sudo systemctl start guacd.service

Verifying: sudo systemctl status guacd.service

LDAP method for login

we will modify or create **guacamole.properties** and **guacd.conf** files into guacamole home directory.

We are creating guacd.conf for Ipv4 as guacamole is always trying to connect ipv6 , it should look like below image.

```
Linux-A2-LinuxMintClient
```

```
File Edit View Search Terminal Tabs Help
```

```
GNU nano 5.6.1
```

```
[daemon]
pid_file = /var/run/guacd.pid
log_level = info
```

```
[server]
bind_host = 127.0.0.1
bind_port = 4822
```

```
harshul@Rockyguac:/etc/guacamole
```

```
harshul@linuxA2Client:~/Downloads
```

```
harshul@ubuntu:~-
```

```
Enforce US Keyboard Layout View Fullscreen Send Ctrl+Alt+Delete
```

```
643 PM 11/21/2024
```

Following are the details of **guacamole.properties** file.

```
Linux-A2-LinuxMintClient
```

```
File Edit View Search Terminal Tabs Help
```

```
GNU nano 5.6.1
```

```
#hostname and Port
guacd-hostname: 127.0.0.1
guacd-port: 4822
enable-websocket: true
```

```
#auth-provider: net.sourceforge.guacamole.net.auth.ldap.LDAPAuthenticationProvider, net.sourceforge.guacamole.net.auth.mysql.MySQLAuthenticationProvider
auth-provider: net.sourceforge.guacamole.net.auth.FileAuthenticationProvider
```

```
# LDAP Configuration
#Domain controller's Fully Qualified Domain Name or IP and port
ldap-hostname: 172.23.83.85
ldap-port: 389
ldap-encryption-method: none
ldap-user-base-dn: ou=LinuxA2,dc=Linux2,dc=local
#Authentication for Domain
ldap-username-attribute: sAMAccountName
ldap-search-bind-dn: cn=quacamole,ou=LinuxA2,dc=Linux2,dc=local
ldap-search-bind-password: Secret55!
ldap-group-name-attribute:cn
ldap-member-attribute: member
```

```
#database
```

```
mysql-hostname: 127.0.0.1
mysql-database: guacdb
mysql-username: gca
mysql-password: Secret55!
```

```
harshul@Rockyguac:/etc/guacamole
```

```
guacamole.properties
```

```
harshul@ubuntu:~-
```

```
Enforce US Keyboard Layout View Fullscreen Send Ctrl+Alt+Delete
```

```
642 PM 11/21/2024
```

Download and Install LDAP Authentication Extension

Download LDAP Extension: wget <https://guacamole.apache.org/releases/1.5.5/guacamole-auth-ldap-1.5.5.tar.gz>

Extract the file: tar -xvf guacamole-auth-ldap-1.5.5.tar.gz

Move the JAR File to Extensions Folder:

```
sudo cp /etc/guacamole/extensions/guacamole-auth-ldap-1.5.5/guacamole-auth-ldap-1.5.5.jar /etc/guacamole/extensions/
```

Apache Tomcat in Rocky Linux

Install Apache Tomcat and OpenJDK:

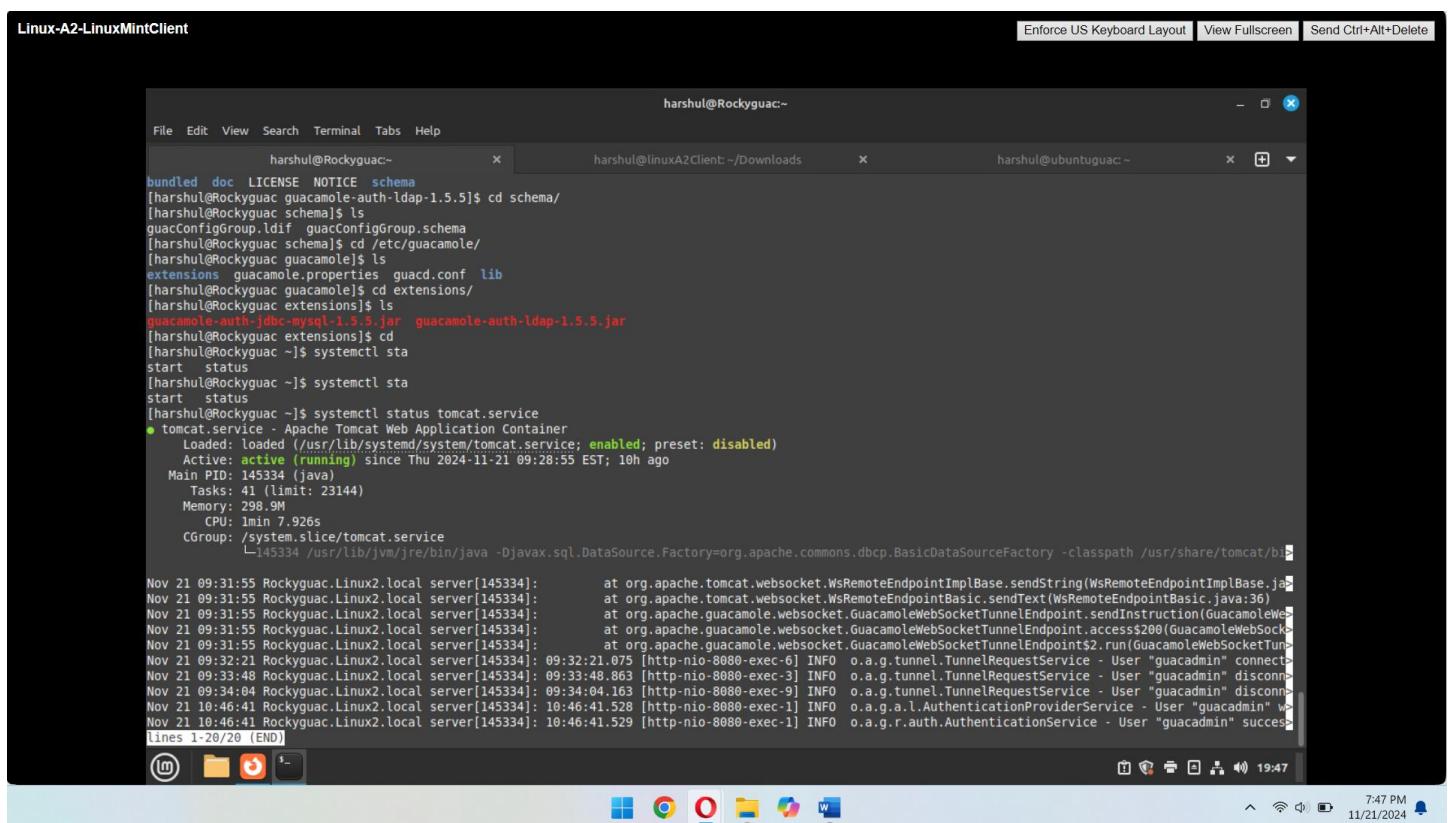
```
sudo dnf install java-17-openjdk-devel tomcat tomcat-admin-webapps tomcat-webapps
```

Download and Deploy Guacamole WAR File

Rename and move it to tomcat : sudo mv guacamole-1.5.5.war /var/lib/tomcat/webapps/guacamole.war

Restart the service: sudo systemctl restart tomcat.service

Check the status: sudo systemctl status tomcat.service



```
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:~          harshul@linuxA2Client:~/Downloads          harshul@ubuntuguac:~
bundled doc LICENSE NOTICE schema
[harshul@Rockyguac guacamole-auth-ldap-1.5.5]$ cd schema/
[harshul@Rockyguac schema]$ ls
guacConfigGroup.ldif guacConfigGroup.schema
[harshul@Rockyguac schema]$ cd /etc/guacamole/
[harshul@Rockyguac guacamole]$ ls
extensions guacamole.properties guacd.conf lib
[harshul@Rockyguac guacamole]$ cd extensions/
[harshul@Rockyguac extensions]$ ls
guacamole-auth-jdbc-mysql-1.5.5.jar guacamole-auth-ldap-1.5.5.jar
[harshul@Rockyguac extensions]$ cd
[harshul@Rockyguac ~]$ systemctl start
start status
[harshul@Rockyguac ~]$ systemctl start
start status
[harshul@Rockyguac ~]$ systemctl status tomcat.service
● tomcat.service - Apache Tomcat Web Application Container
  Loaded: loaded (/usr/lib/systemd/system/tomcat.service; enabled; preset: disabled)
  Active: active (running) since Thu 2024-11-21 09:28:55 EST; 10h ago
    Main PID: 145334 (java)
      Tasks: 41 (limit: 23144)
        Memory: 298.9M
          CPU: 1min 7.926s
        CGroup: /system.slice/tomcat.service
           └─145334 /usr/lib/jvm/jre/bin/java -Djavax.sql.DataSource.Factory=org.apache.commons.dbcp.BasicDataSourceFactory -classpath /usr/share/tomcat/bi

Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendString(WsRemoteEndpointImplBase.java:145)
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.tomcat.websocket.WsRemoteEndpointBasic.sendText(WsRemoteEndpointBasic.java:36)
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.guacamole.websocket.GuacamoleWebSocketTunnel.Endpoint.sendInstruction(GuacamoleWebSoc...
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.guacamole.websocket.GuacamoleWebSocketTunnel.Endpoint.access$200(GuacamoleWebSoc...
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.guacamole.websocket.GuacamoleWebSocketTunnel.Endpoint$2.run(GuacamoleWebSocketTun...
Nov 21 09:32:21 Rockyguac.Linux2.local server[145334]: 09:32:21.075 [http-nio-8080-exec-6] INFO o.a.g.tunnel.TunnelRequestService - User "guacamain" connect...
Nov 21 09:33:48 Rockyguac.Linux2.local server[145334]: 09:33:48.863 [http-nio-8080-exec-3] INFO o.a.g.tunnel.TunnelRequestService - User "guacamain" disconnect...
Nov 21 09:34:04 Rockyguac.Linux2.local server[145334]: 09:34:04.163 [http-nio-8080-exec-9] INFO o.a.g.tunnel.TunnelRequestService - User "guacamain" disconnect...
Nov 21 10:46:41 Rockyguac.Linux2.local server[145334]: 10:46:41.528 [http-nio-8080-exec-1] INFO o.a.g.a.l.AuthenticationProviderService - User "guacamain" w...
Nov 21 10:46:41 Rockyguac.Linux2.local server[145334]: 10:46:41.529 [http-nio-8080-exec-1] INFO o.a.g.r.auth.AuthenticationService - User "guacamain" success...
Lines 1-20/20 (END)
```

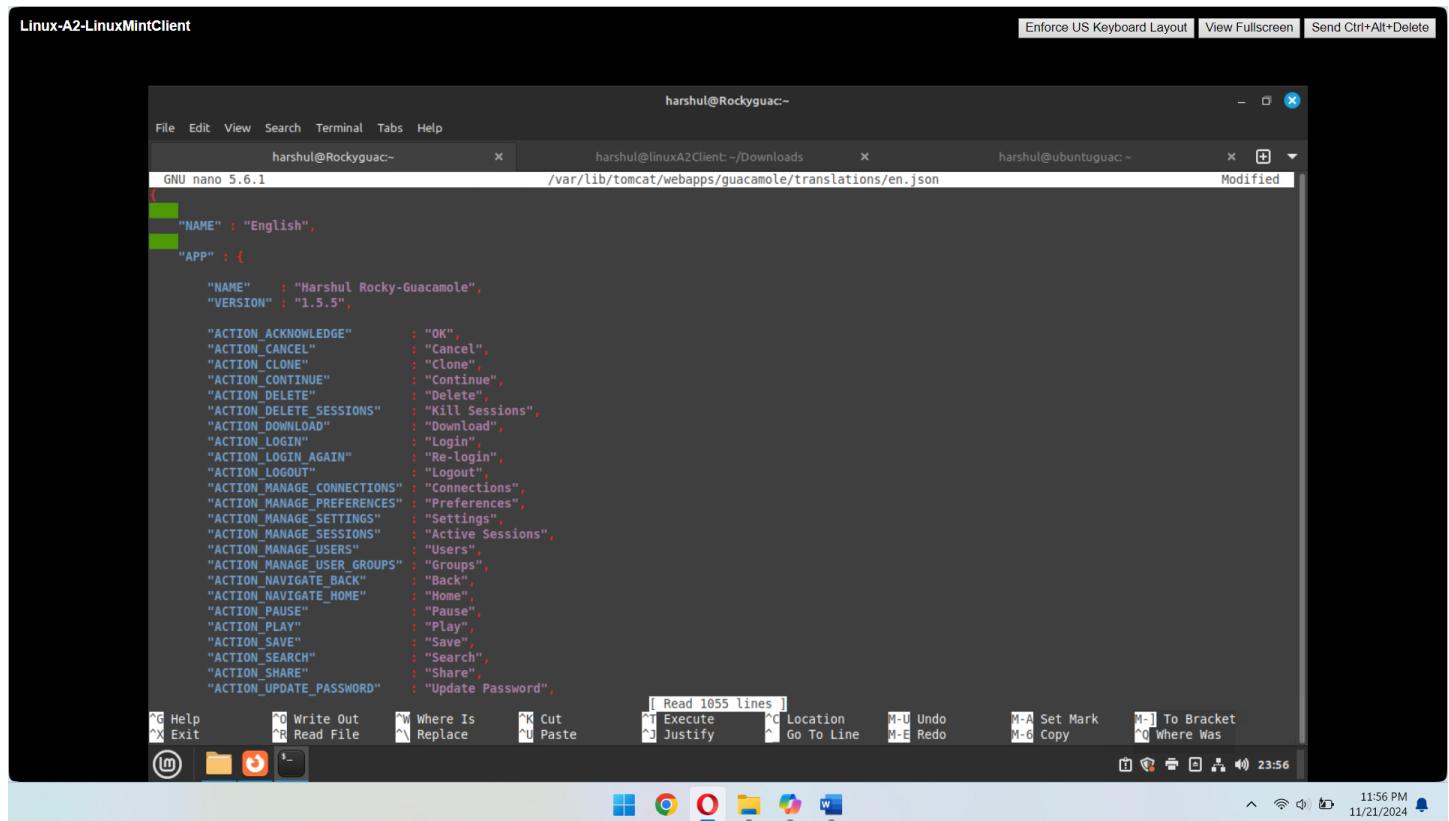
Changing the Web Page Appearance for Guacamole on Rocky Linux

Navigate to the Webapps Directory: cd /var/lib/tomcat9/webapps/

Open the en.json File: sudo nano /var/lib/tomcat9/webapps/guacamole/translations/en.json

Change the title name to: "NAME": "Harshul Rocky-Guacamole"

Save and Exit: Ctrl + O , Ctrl + X



```

Linux-A2-LinuxMintClient
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:~ harshul@linuxA2Client:~/Downloads harshul@ubuntuguac:~
GNU nano 5.6.1 /var/lib/tomcat9/webapps/guacamole/translations/en.json Modified
{
  "NAME" : "English",
  "APP" : {
    "NAME" : "Harshul Rocky-Guacamole",
    "VERSION" : "1.5.5",
    "ACTION_ACKNOWLEDGE" : "OK",
    "ACTION_CANCEL" : "Cancel",
    "ACTION_CLONE" : "Clone",
    "ACTION_CONTINUE" : "Continue",
    "ACTION_DELETE" : "Delete",
    "ACTION_DELETE_SESSIONS" : "Kill Sessions",
    "ACTION_DOWNLOAD" : "Download",
    "ACTION_LOGIN" : "Login",
    "ACTION_LOGIN AGAIN" : "Re-login",
    "ACTION_LOGOUT" : "Logout",
    "ACTION_MANAGE_CONNECTIONS" : "Connections",
    "ACTION_MANAGE_PREFERENCES" : "Preferences",
    "ACTION_MANAGE_SETTINGS" : "Settings",
    "ACTION_MANAGE_SESSIONS" : "Active Sessions",
    "ACTION_MANAGE_USERS" : "Users",
    "ACTION_MANAGE_USER_GROUPS" : "Groups",
    "ACTION_NAVIGATE_BACK" : "Back",
    "ACTION_NAVIGATE_HOME" : "Home",
    "ACTION_PAUSE" : "Pause",
    "ACTION_PLAY" : "Play",
    "ACTION_SAVE" : "Save",
    "ACTION_SEARCH" : "Search",
    "ACTION_SHARE" : "Share",
    "ACTION_UPDATE_PASSWORD" : "Update Password"
  }
}
  
```

Database Setup for Guacamole on Rocky Linux

Install MariaDB Server

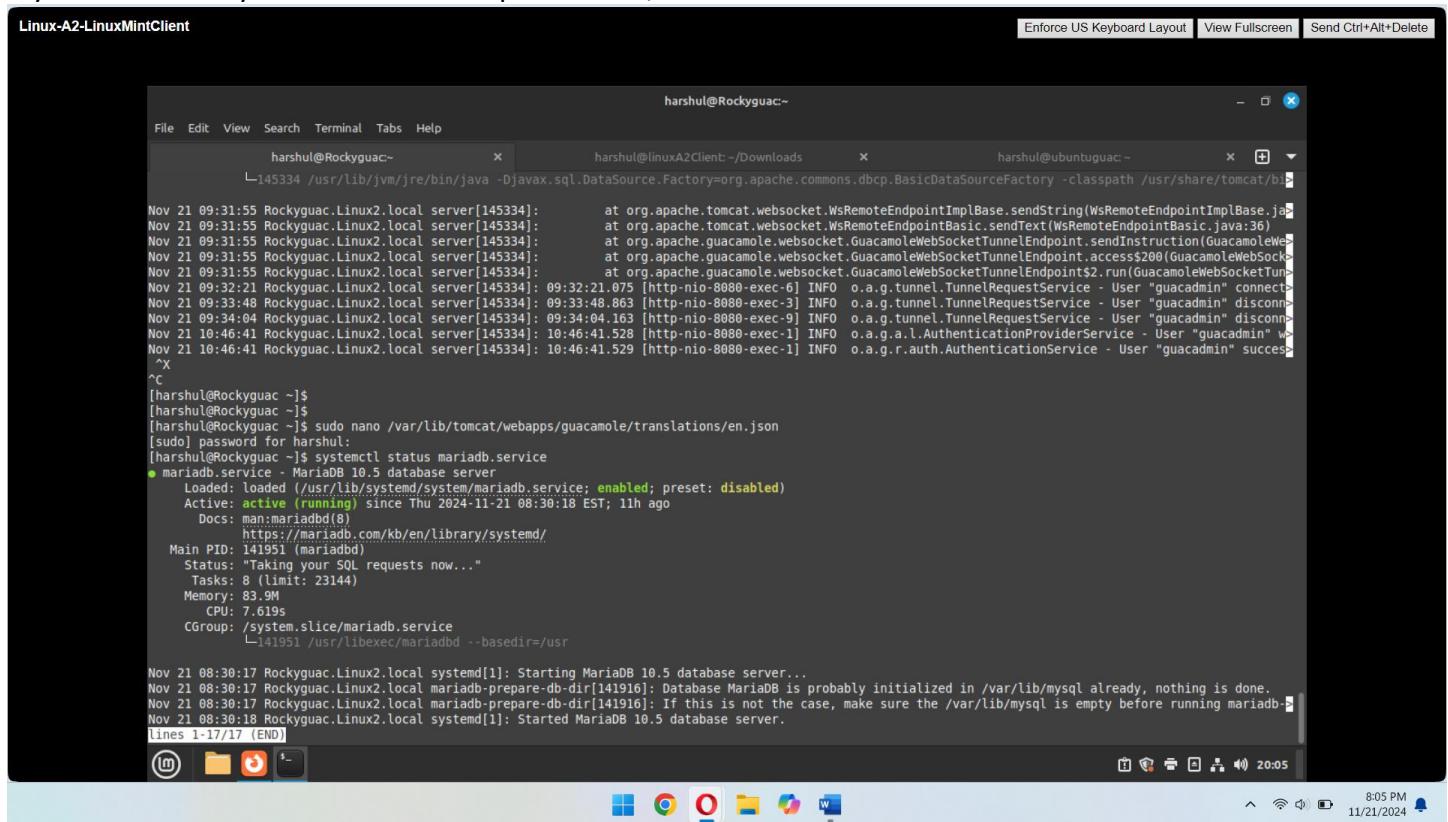
Database Install : sudo dnf install mariadb-server

Database enable: sudo systemctl enable mariadb.service

Database start: sudo systemctl start mariadb.service

Database status: sudo systemctl status mariadb.service

If you have already installed it with dependencies, then check the status of database



```

Linux-A2-LinuxMintClient
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:~ x harshul@linuxA2Client:~/Downloads x harshul@ubuntuguac:~ x
L-145334 /usr/lib/jvm/jre/bin/java -Djavax.sql.DataSource.Factory=org.apache.commons.dbcp.BasicDataSourceFactory -classpath /usr/share/tomcat/b
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendString(WsRemoteEndpointImplBase.java:36)
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.tomcat.websocket.WsRemoteEndpointBasic.sendText(WsRemoteEndpointBasic.java:36)
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.guacamole.websocket.GuacamoleWebSocketTunnelEndpoint.sendInstruction(GuacamoleWebS
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]:      at org.apache.guacamole.websocket.GuacamoleWebSocketTunnelEndpoint$2.run(GuacamoleWebSocketTun
Nov 21 09:32:21 Rockyguac.Linux2.local server[145334]: 09:32:21.075 [http-nio-8080-exec-6] INFO o.a.g.tunnel.TunnelRequestService - User "guacadmin" connect
Nov 21 09:33:48 Rockyguac.Linux2.local server[145334]: 09:33:48.863 [http-nio-8080-exec-3] INFO o.a.g.tunnel.TunnelRequestService - User "guacadmin" disconnect
Nov 21 09:34:04 Rockyguac.Linux2.local server[145334]: 09:34:04.163 [http-nio-8080-exec-9] INFO o.a.g.tunnel.TunnelRequestService - User "guacadmin" disconnect
Nov 21 10:46:41 Rockyguac.Linux2.local server[145334]: 10:46:41.528 [http-nio-8080-exec-1] INFO o.a.g.a.l.AuthenticationProviderService - User "guacadmin" was
Nov 21 10:46:41 Rockyguac.Linux2.local server[145334]: 10:46:41.529 [http-nio-8080-exec-1] INFO o.a.g.r.auth.AuthenticationService - User "guacadmin" success
^X
^C
[harshul@Rockyguac ~]$ 
[harshul@Rockyguac ~]$ 
[harshul@Rockyguac ~]$ sudo nano /var/lib/tomcat/webapps/guacamole/translations/en.json
[sudo] password for harshul:
[harshul@Rockyguac ~]$ systemctl status mariadb.service
● mariadb.service - MariaDB 10.5 database server
   Loaded: loaded (/usr/lib/systemd/system/mariadb.service; enabled; preset: disabled)
   Active: active (running) since Thu 2024-11-21 08:30:18 EST; 11h ago
     Docs: man:mariadb(8)
           https://mariadb.com/kb/en/library/systemd/
   Main PID: 141951 (mariadb)
     Status: "Taking your SQL requests now..."
    Tasks: 8 (limit: 23144)
   Memory: 83.9M
      CPU: 7.619s
     CGroup: /system.slice/mariadb.service
             └─141951 /usr/libexec/mariadb --basedir=/usr

Nov 21 08:30:17 Rockyguac.Linux2.local systemd[1]: Starting MariaDB 10.5 database server...
Nov 21 08:30:17 Rockyguac.Linux2.local mariadb-prepare-db-dir[141916]: Database MariaDB is probably initialized in /var/lib/mysql already, nothing is done.
Nov 21 08:30:17 Rockyguac.Linux2.local mariadb-prepare-db-dir[141916]: If this is not the case, make sure the /var/lib/mysql is empty before running mariadb-
Nov 21 08:30:18 Rockyguac.Linux2.local systemd[1]: Started MariaDB 10.5 database server.
Lines 1-17/17 (END)

[Icons] [File] [Terminal] [Help] [Close] 8:05 PM 11/21/2024

```

Now, we are going to create database and add user to database and give permissions

Open database as the root user: sudo mysql -u root -p

Enter password and then create a database

Create database : Create database guacdb;

Create user and give password: create user gca@localhost identified by 'Secret55!';

Grant permissions: grant SELECT,UPDATE,INSERT,DELETE on guacdb.* to gca@localhost;

Apply: flush privileges;

Check the user and database:

SELECT user FROM mysql.user;

show databases;

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

MariaDB [(none)]> select user from mysql.user;
+-----+
| User |
+-----+
| gca   |
| guacadmin |
| mariadb.sys |
| mysql  |
| root   |
+-----+
5 rows in set (0.045 sec)

MariaDB [(none)]> show databases;
+-----+
| Database |
+-----+
| guacdb   |
| information_schema |
| mysql    |
| performance_schema |
+-----+
4 rows in set (0.000 sec)

MariaDB [(none)]>
```

Adding JDBC Authentication for Guacamole on Rocky Linux

Use wget to download the JDBC file:

wget <https://guacamole.apache.org/releases/1.5.5/guacamole-auth-jdbc-1.5.5.tar.gz>

Extract the File: tar -xvf guacamole-auth-jdbc-1.5.5.tar.gz

Once it is extracted go to the file and go to sql folder: cd guacamole-auth-jdbc-1.5.5/mysql

Move the JAR file to the extensions directory: sudo cp guacamole-auth-jdbc-1.5.5.jar /etc/guacamole/extensions

Add Schema Files to the Database: check you are in the sql directory then run:

sudo mysql -u root -p guacdb < schema/001-createschema.sql

sudo mysql -u root -p guacdb < schema/002-createadmin-user.sql

Download and Install MySQL Connector

Download MySQL Connector: wget <https://dev.mysql.com/get/Downloads/Connector-J/mysql-connector-j8.0.31.tar.gz>

extract it : tar xzvf mysql-connector-j-8.0.31.tar.gz

Copy MySQL Connector to lib Directory:

Go to directory : cd /path/to/extracted/mysql-connector-j-8.0.31/

Copy the JAR File to lib Directory: sudo cp mysql-connector-j-8.0.31.jar /etc/guacamole/lib/

Update guacamole.properties : sudo nano /etc/guacamole/guacamole.properties

```

harshul@Rockyguac:/etc/guacamole
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:/etc/guacamole x harshul@linuxA2Client:~/Downloads x harshul@ubuntuGuac:~ x
GNU nano 5.6.1
guacd-hostname: 127.0.0.1
guacd-port: 4822
enable-websocket: true

#auth-provider: net.sourceforge.guacamole.net.auth.ldap.LDAPAuthenticationProvider, net.sourceforge.guacamole.net.auth.mysql.MySQLAuthenticationProvider
auth-provider: net.sourceforge.guacamole.net.auth.FileAuthenticationProvider

# LDAP Configuration
#Domain controller's Fully Qualified Domain Name or IP and port
ldap-hostname: 172.23.83.85
ldap-port: 389
ldap-encryption-method: none
ldap-user-base-dn: ou=LinuxA2,dc=Linux2,dc=local
#Authentication for Domain
ldap-username-attribute: sAMAccountName
ldap-search-bind-dn: cn=guacadmin,ou=LinuxA2,dc=Linux2,dc=local
ldap-search-bind-password: Secret55!
ldap-group-name-attribute:cn
ldap-member-attribute: member

#database
mysql-hostname: 127.0.0.1
mysql-database: guacdb
mysql-username: gca
mysql-password: Secret55!

[ Read 29 lines ] Execute Justify Location Go To Line M-U Undo M-A Set Mark M-G Copy M-J To Bracket
[ Read 29 lines ] Help Write Out Where Is Cut Paste Execute Justify Location Go To Line M-U Undo M-A Set Mark M-G Copy M-J To Bracket
[ Read 29 lines ] Exit Read File Replace Cut Paste Execute Justify Location Go To Line M-U Undo M-A Set Mark M-G Copy M-J To Bracket
[ Read 29 lines ] 18:42
[ Read 29 lines ] 6:42 PM 11/21/2024

```

We need to create guacadmin in AD in Domain controller as default username is guacadmin in database so we can log in and make it work.

Server Manager

Active Directory Users and Computers

File Action View Help

guacadmin Properties

Name	Type
gca	User
guacadmin	User
Harskul	User
trial	User

Published Certificates Member Of Password Replication Dial-In Object

Security Environment Sessions Remote control

Remote Desktop Services Profile COM+ Attribute Editor

General Address Account Profile Telephones Organization

guacadmin

First name: guacadmin Initials:

Last name:

Display name: guacadmin

Description:

Office:

Telephone number: Other...

Email: Other...

Web page:

Published Certificates Member Of Password Replication Dial-In Object

Security Environment Sessions Remote control

Remote Desktop Services Profile COM+ Attribute Editor

General Address Account Profile Telephones Organization

guacadmin

Created: 11/6/2024 5:31 AM

Updated: Yesterday at 8:30 PM

Antivirus: Real-Time Protection: Off

Anti-malware: Settings

Anti-spam: Off

Time Zone: (UTC-08:00) Pacific Time (US & Canada)

Not activated

Processor: Intel(R) Xeon(R) Platinum 8268 CPU @ 2.90GHz

Memory: 4 GB

Storage: 89.4 GB

OK Cancel Apply Help

Filter Log Date and Time

Server Name	ID	Severity	Source	Log	Date and Time
LINUX2-HARSHUL	1023	Error	Microsoft-Windows-PerfLib	Application	11/21/2024 6:27:52 AM
LINUX2-HARSHUL	8198	Error	Microsoft-Windows-Security-SPP	Application	11/21/2024 4:17:03 AM

Activate Windows
Go to Settings to activate Windows.

8:34 PM 11/21/2024

11:34 PM 11/21/2024

Restart all the services and check the status of all services

```
Sudo systemctl restart tomcat.service mariadb.service guacd.service
Sudo systemctl status tomcat.service mariadb.service guacd.service
```

```
harshul@Rockyguac:~ harshul@linuxA2Client:~/Downloads harshul@ubuntuguac:~ 
File Edit View Search Terminal Tabs Help
harshul@Rockyguac:~ x harshul@linuxA2Client:~/Downloads x harshul@ubuntuguac:~ x
Loaded: loaded (/etc/systemd/system/guacd.service; enabled; preset: disabled)
Active: active (running) since Thu 2024-11-21 09:28:54 EST; 14h ago
Main PID: 145329 (guacd)
Tasks: 1 (limit: 23144)
Memory: 10.7M
CPU: 3.672s
CGroup: /system.slice/guacd.service
└─145329 /usr/local/sbin/guacd -f

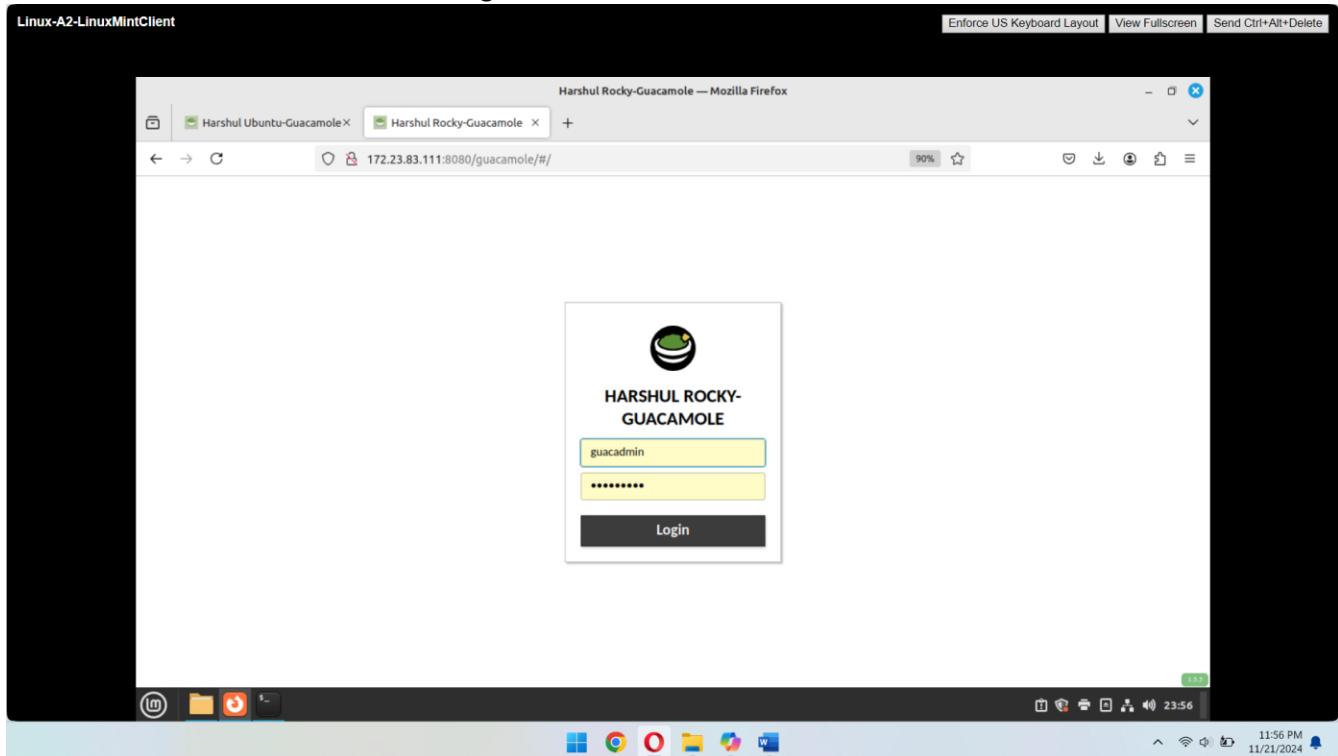
Nov 21 09:33:48 Rockyguac.Linux2.local guacd[145329]: Connection "$db81ef68-1e1d-4390-ae71-1202b5670fa3" removed.
Nov 21 09:33:48 Rockyguac.Linux2.local guacd[145329]: guacd[145329]: INFO: Connection "$db81ef68-1e1d-4390-ae71-1202b5"
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145905]: User "@cc2d6694-9f2c-435e-a19c-3875b0211b9a" disconnected (0 users remaining)
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145905]: guacd[145905]: INFO: User "@cc2d6694-9f2c-435e-a19c-3875b0211b9a"
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145905]: guacd[145905]: INFO: Last user of connection "$36249250-48e3-47d4-a970-a14d17ee453c" disconnected
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145905]: guacd[145905]: Internal RDP client disconnected
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145905]: guacd[145905]: INFO: Internal RDP client disconnected
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145329]: Connection "$36249250-48e3-47d4-a970-a14d17ee453c" removed.
Nov 21 09:34:04 Rockyguac.Linux2.local guacd[145329]: guacd[145329]: INFO: Connection "$36249250-48e3-47d4-a970-a14d17ee453c" removed.

● tomcat.service - Apache Tomcat Web Application Container
  Loaded: loaded (/usr/lib/systemd/system/tomcat.service; enabled; preset: disabled)
  Active: active (running) since Thu 2024-11-21 09:28:55 EST; 14h ago
    Main PID: 145334 (java)
      Tasks: 41 (limit: 23144)
        Memory: 299.0M
          CPU: 1min 22.759s
        CGroup: /system.slice/tomcat.service
            └─145334 /usr/lib/jvm/jre/bin/java -Djavax.sql.DataSource.Factory=org.apache.commons.dbcp.BasicDataSourceFactory

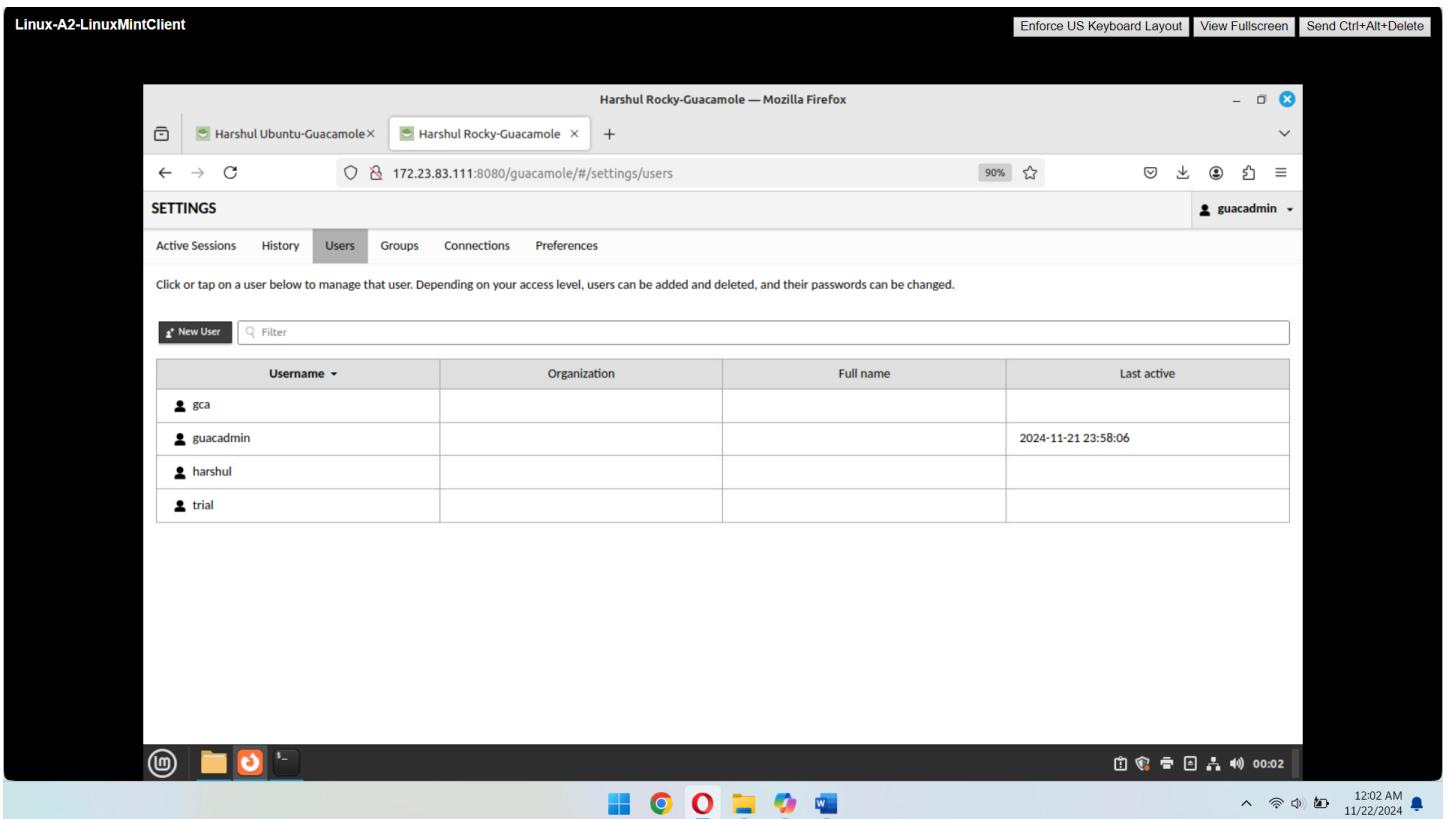
Nov 21 09:31:55 Rockyguac.Linux2.local server[145334]: at org.apache.tomcat.websocket.WsRemoteEndpointImplBase.sendString(...
lines 1-32.. skipping...
● guacd.service - Guacamole proxy daemon
  Loaded: loaded (/etc/systemd/system/guacd.service; enabled; preset: disabled)
  Active: active (running) since Thu 2024-11-21 09:28:54 EST; 14h ago
    Main PID: 145329 (guacd)
      Tasks: 1 (limit: 23144)
```

The terminal window shows three tabs: 'harshul@Rockyguac:~' (active), 'harshul@linuxA2Client:~/Downloads', and 'harshul@ubuntuguac:~'. The 'Rockyguac' tab displays the system logs for the guacd service, showing multiple connections being established and disconnected. The 'tomcat' service is also listed as active. The 'guacd' service is shown as running.

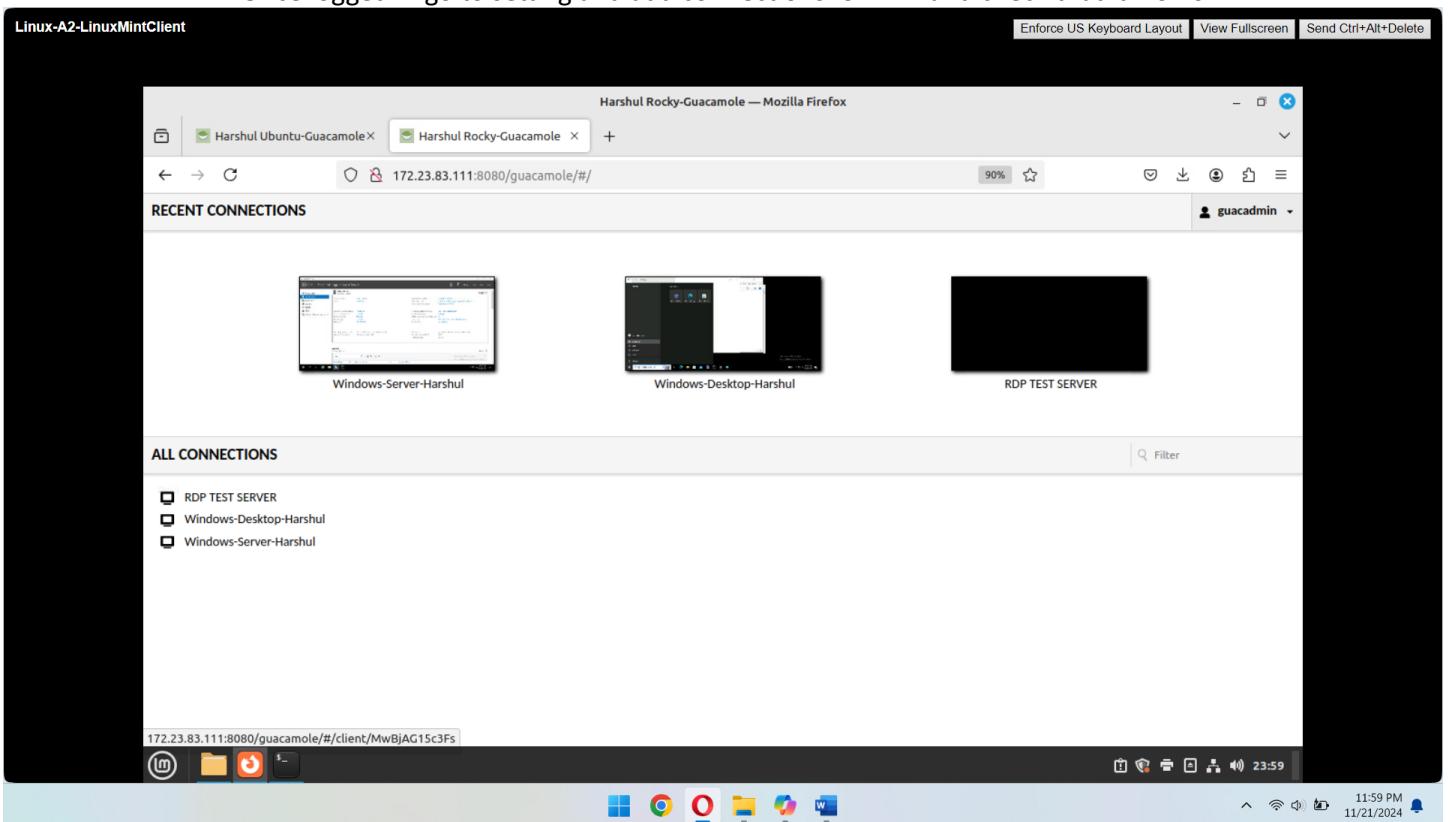
Go to the browser and check with login



We can see our users



Once logged in go to setting and add connections for RDP and check that it works



8.Loadballancer and Reverse Proxy

install the apache2 server and other dependencies for load balancing

Install Apache2: sudo apt install apache2

Install Additional Apache2 Modules: sudo apt install apache2-dev apache2-utils apache2-data

Enable required modules.

Enable Proxy Module:`sudo a2enmod proxy`

Enable Proxy HTTP Module: sudo a2enmod proxy_http

Enable Load Balancer Module: sudo a2enmod mod_balancer

Enable Load Balancing Method by Requests Module: sudo a2enmod lbmethod_byrequests

Make sure the firewall is disabled

Disable UFW Service:sudo systemctl disable ufw.service

Stop UFW Service:sudo systemctl stop ufw.service

Now enable and restart the apache2

Enable Apache2 to Start at Boot: sudo systemctl enable apache2

Restart Apache2 Service: sudo systemctl restart apache2.service

Check Apache2 Service Status: sudo systemctl status apache2.service

Configure the .conf file for load balancing

Go to file: cd /etc/apache2/sites-enabled/

Edit it:sudo nano 00-default.conf

Follow the image below for details

```

harshul@ubuntuloadbalancer:/etc/apache2/sites-available
File Edit View Search Terminal Tabs Help
GNU nano 6.2
harshul@ubuntuloadbalancer:/etc/apache2/sites-available 000-default.conf
<VirtualHost *:80>
    ServerName www.linuxtest.ca

    ProxyPreserveHost On
    ProxyRequests Off

    <Proxy balancer://lb_guacamole>
        BalancerMember http://172.23.83.111:8080/guacamole route=172.23.83.111
        BalancerMember http://ubuntuguac.linux2.local:8080/guacamole route=172.23.83.111
    # route=172.23.83.87
        BalancerMember http://172.23.83.111:8080/guacamole route=172.23.83.111
        ProxySet lbmethod=byrequests
        ProxySet stickySession=ROUTEID
    </Proxy>

    ProxyPass / balancer://lb_guacamole/
    ProxyPassReverse / balancer://lb_guacamole/

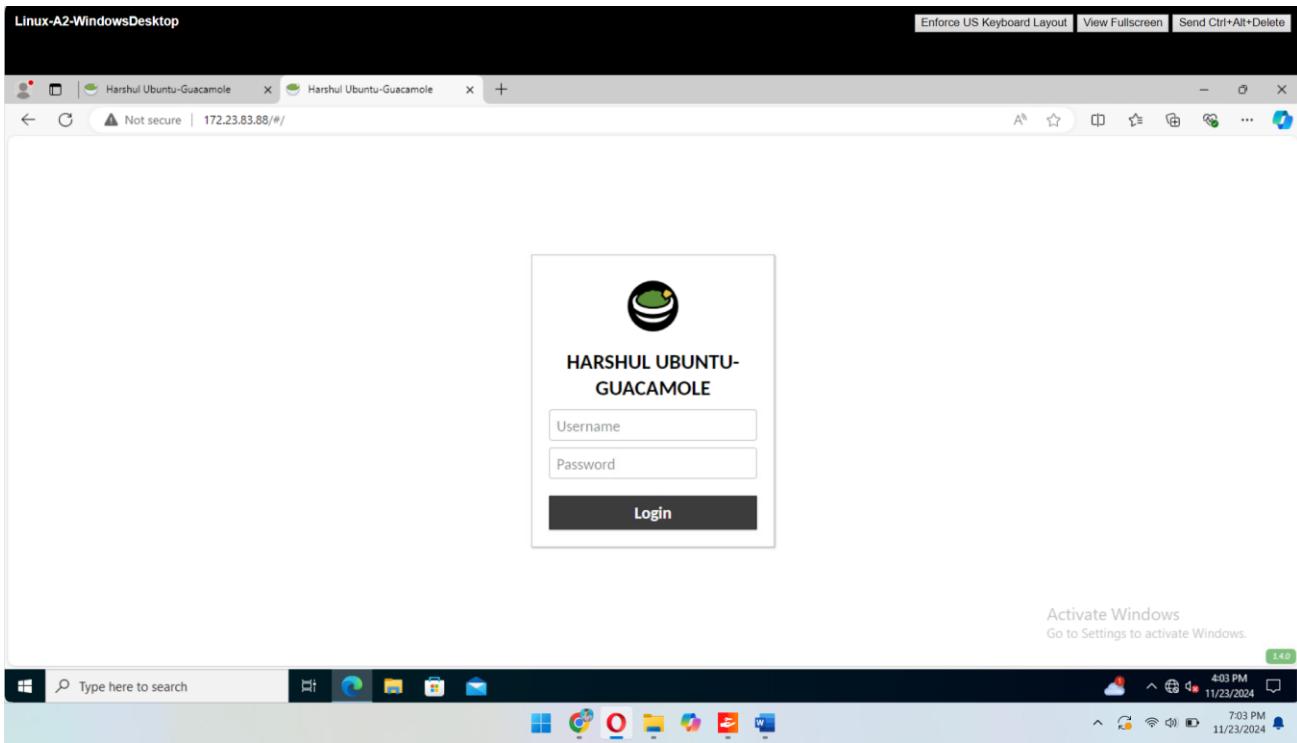
    <Location /websocket-tunnel>
        ProxyPass ws://balancer://lb_guacamole/websocket-tunnel
        ProxyPassReverse ws://balancer://lb_guacamole/websocket-tunnel
    </Location>

    Header add Set-Cookie "ROUTEID=%{BALANCER_WORKER_ROUTE}e; path=/; env=BALANCER_ROUTE_CHANGED"

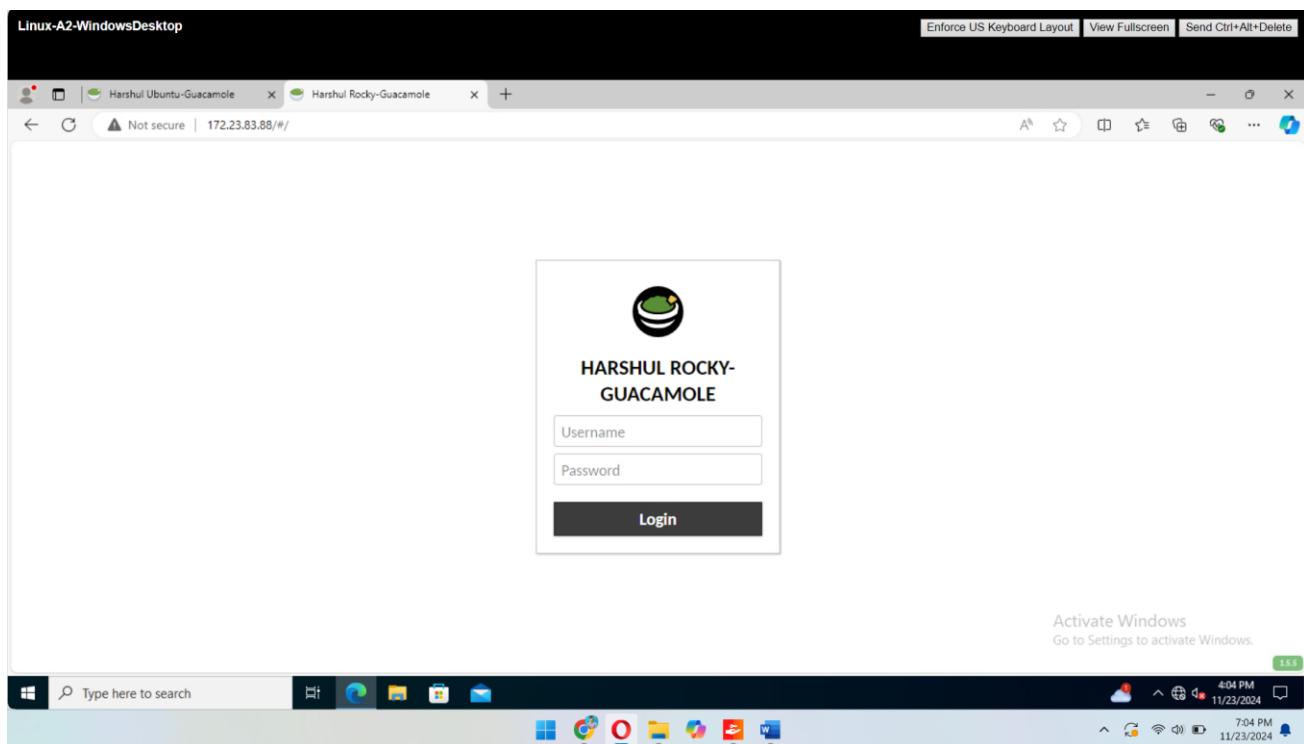
    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>

```

go to browser and type the ip address of the apache2 server : 172.23.83.88

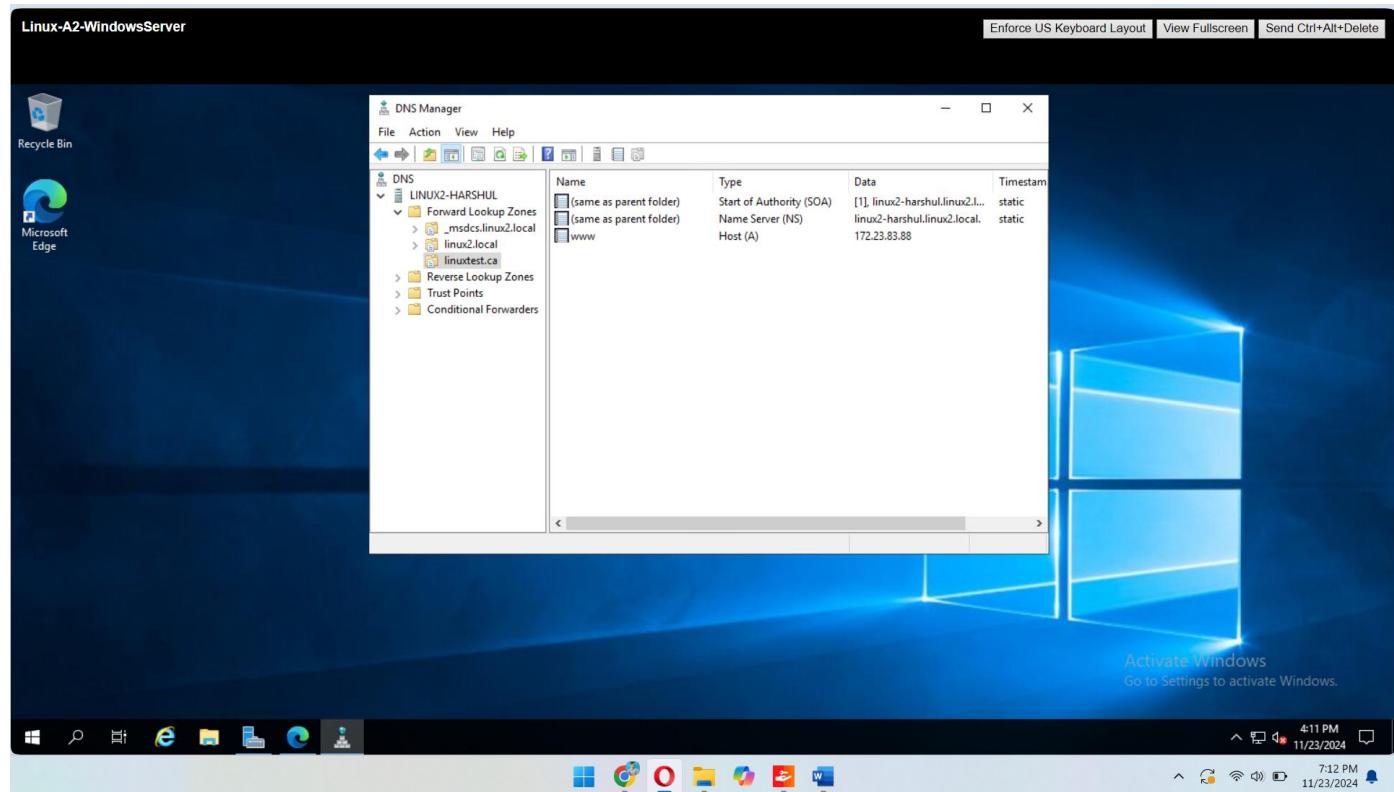


Power down ubuntu guacamole and you should be able to see the Rocky guacamole login page as well



Reverse Proxy Configuration

Go to Domain Controller and check DNS Manager see record is present and make forward lookup zone name linuxtest.ca.



Create Forward Lookup Zone

Right-click on **Forward Lookup Zone**.

Select **New Zone**.

Create **Primary Zone**

Create Host Record for Network Load Balancer

Inside new zone > right-click and select **New Host (A or AAAA)**.

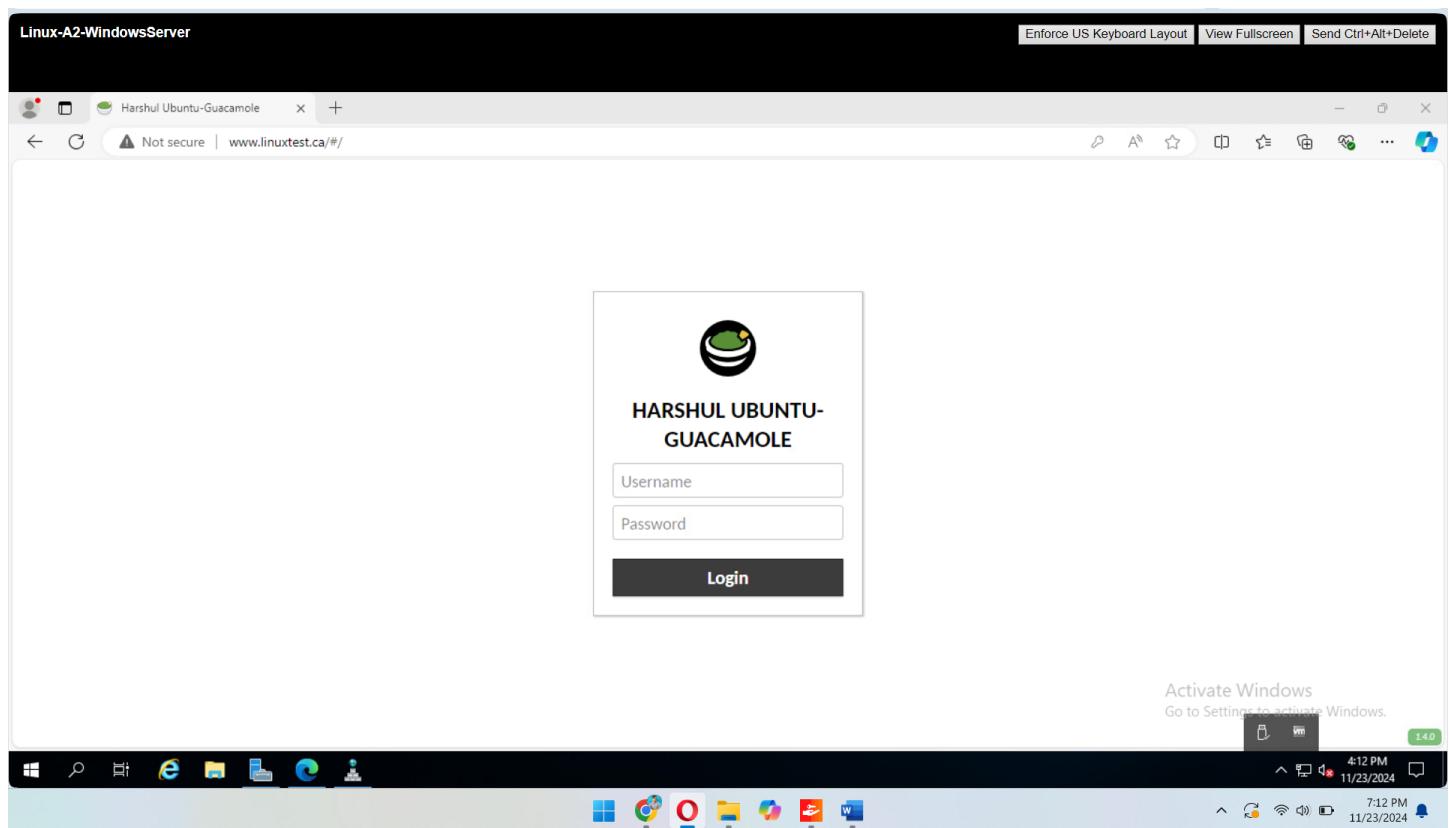
Enter **www** as name and **172.23.83.88** as IP address.

Verify Configuration

go to <http://www.linuxtest.ca>. It will go to one of load balancing servers.

Test Load Balancer

Turn off the Fedora server and verify that load balancer still redirects properly.



References

Apache GuacamoleTM: 1.4.0. (n.d.). <https://guacamole.apache.org/releases/1.4.0/>

Apache GuacamoleTM: 1.5.5. (n.d.). <https://guacamole.apache.org/releases/1.5.5/>

Installing Guacamole natively — Apache Guacamole Manual v1.5.5. (n.d.).

<https://guacamole.apache.org/doc/gug/installing-guacamole.html>

LDAP authentication — Apache Guacamole Manual v1.5.5. (n.d.).

<https://guacamole.apache.org/doc/gug/ldap-auth.html>

Proxying Guacamole — Apache Guacamole manual V1.5.5. (n.d.).

<https://guacamole.apache.org/doc/gug/reverse-proxy.html>