**1. VirtualBox Network Setup**

**Why This Is Needed:**

Your Ubuntu VM (running FreeRADIUS) and your Windows host (running MySQL and Workbench) must be able to communicate. This is achieved by configuring VirtualBox so that both machines are on the same network segment.

**Options:**

**A. Bridged Adapter**

* **How-to Configure:**
  1. **Shut Down the Ubuntu VM.**
  2. **Open VirtualBox Manager:**
     + Select your Ubuntu VM.
     + Click **Settings** → **Network**.
     + For **Adapter 1**, set “Attached to:” to **Bridged Adapter**.
     + Choose your active network interface (e.g., your Wi-Fi or Ethernet adapter).
  3. **Start the Ubuntu VM.**
* **Example: Checking the IP on Ubuntu:** Run in the terminal:

ip addr show

**Example Output:**

2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc fq\_codel state UP group default qlen 1000

link/ether 08:00:27:15:79:ef brd ff:ff:ff:ff:ff:ff

inet 192.168.1.15/24 brd 192.168.1.255 scope global dynamic enp0s3

valid\_lft 86376sec preferred\_lft 86376sec

#### ****B. Host-Only Adapter****

* **How-to Configure:**
  1. **Open VirtualBox Manager → File → Host Network Manager.**
  2. **Create a New Host-Only Network:**  
     This will generate a subnet (for example, 192.168.56.0/24).
  3. **Set the VM’s Network:**
     + Go to your VM’s **Settings** → **Network**.
     + For **Adapter 1**, choose **Host-Only Adapter** and select the host-only network you created.
  4. **Start the VM.**
* **Example: Checking the IP on Ubuntu:**

ip addr show

2: enp0s8: <BROADCAST,MULTICAST,UP,LOWER\_UP> mtu 1500 qdisc pfifo\_fast state UP group default qlen 1000 link/ether 08:00:27:34:ab:cd brd ff:ff:ff:ff:ff:ff inet 192.168.56.101/24 brd 192.168.56.255 scope global dynamic enp0s8 valid\_lft 7200sec preferred\_lft 7200sec

## 2. Installing FreeRADIUS and MySQL Module on Ubuntu

### ****Why This Is Needed:****

You need FreeRADIUS to authenticate users and connect to the MySQL database so that authentication data can be stored/retrieved.

### ****Steps:****

1. **Update Package Lists and Install Packages:**

Run:

sudo apt-get update

sudo apt-get install freeradius freeradius-mysql

**Locate the SQL Module Configuration File:**

* **Location:**  
  The configuration file is typically located at:

/etc/freeradius/3.0/mods-available/sql

*  **Purpose:**  
  This file tells FreeRADIUS how to connect to your MySQL database.

 **Editing the SQL Configuration File:**

Open the file with your preferred text editor (e.g., nano):

sudo nano /etc/freeradius/3.0/mods-available/sql

**Key Edits:**

* **server:**  
  Change from localhost to the IP address of your Windows host (e.g., 192.168.1.10 for Bridged mode or 192.168.56.1 for Host-Only).

server = "192.168.1.10"

login = "radius\_user"

password = "your\_password"

* **database:**  
  Ensure the correct database name is set (e.g., radius\_database).

**Save and exit:**

* In nano, press **Ctrl+O** to write the file, then **Enter** to confirm, and **Ctrl+X** to exit.

## 3. Enabling the SQL Module in FreeRADIUS

### ****Why This Is Needed:****

FreeRADIUS will not use the SQL module unless it is enabled (i.e., linked into the mods-enabled directory).

### ****Command to Enable the Module:****

sudo ln -s /etc/freeradius/3.0/mods-available/sql /etc/freeradius/3.0/mods-enabled/

(No output means the command executed successfully.)

## 4. Restarting FreeRADIUS and Testing the Connection

### ****Restart FreeRADIUS Service:****

Run:

sudo systemctl restart freeradius

### ****Testing Database Connectivity from Ubuntu:****

1. **Install MySQL Client (if not installed):**

sudo apt-get install mysql-client

**Test Connection:** Replace <Windows\_IP> with your host’s IP (e.g., 192.168.1.10):

mysql -h <Windows\_IP> -u radius\_user –p

**Monitor FreeRADIUS Logs:**

To ensure that the SQL module is connecting properly, watch the logs:

tail -f /var/log/freeradius/radius.log

## 5. Configuring MySQL on the Windows Host

### ****Why This Is Needed:****

MySQL on Windows must allow remote connections and grant privileges to the FreeRADIUS user.

Open **Command Prompt as Administrator** (Win + R, type cmd, press Ctrl + Shift + Enter).

notepad "C:\ProgramData\MySQL\MySQL Server 8.0\my.ini"

### ****Steps:****

1. **Configure MySQL to Listen on All Interfaces:**
   * Locate the MySQL configuration file (my.ini) typically in the MySQL installation folder.
   * Find the bind-address parameter. To allow remote connections, set:

bind-address = 0.0.0.0

*  **Restart MySQL Service** from the Services panel or using Workbench.

 **Set Up User Privileges:**

Open MySQL Workbench or the MySQL command line on Windows and run:

CREATE USER 'radius\_user'@'%' IDENTIFIED BY 'your\_password';

GRANT ALL PRIVILEGES ON radius\_database.\* TO 'radius\_user'@'%';

FLUSH PRIVILEGES;

## 6. Verifying the Complete Setup

### ****From the Ubuntu VM:****

* **Ping the Windows Host:**

## 1. IP Addressing Without DHCP on a Static Network

When your Windows host has a static IP and there isn’t a DHCP server on the network, no device will automatically get an IP address. In such cases, you must manually assign a static IP address to your VM—just as you would for any other device on the network—to ensure proper communication.

## 2. Host-Only Adapter

### ****How It Works:****

* **Host-Only Network:**  
  VirtualBox creates a virtual network interface on your Windows host (for example, one in the 192.168.56.0/24 subnet). By default, VirtualBox may provide a built-in DHCP server for the host-only network. However, if DHCP is not available or you choose not to use it, you’ll have to assign a static IP to the VM.

### ****Static IP Configuration:****

* **On Your Windows Host (Host-Only Adapter):**  
  Your Windows machine will have a host-only IP (e.g., 192.168.56.1).
* **On Your Ubuntu VM:**  
  Manually configure the network settings to use an IP within the same subnet (for example, 192.168.56.101).
  + **Why?**  
    This manual configuration ensures that the VM can communicate with the Windows host. Without DHCP, there’s no server to assign the IP automatically.

### ****Example (Ubuntu with Netplan):****

1. **Locate Your Netplan File:**  
   Typically found in /etc/netplan/. You might have a file like 01-netcfg.yaml.
2. **Edit the File to Set a Static IP:**  
   Open the file in your text editor:

sudo nano /etc/netplan/01-netcfg.yaml

network:

version: 2

ethernets:

enp0s8:

addresses:

- 192.168.56.101/24

gateway4: 192.168.56.1

nameservers:

addresses: [8.8.8.8, 8.8.4.4]

* **np0s8:** Replace with your actual network interface name (check with ip addr).
* **addresses:** Your chosen static IP.
* **gateway4:** Typically the IP of the host-only adapter on Windows.
* Save (Ctrl+O) and exit (Ctrl+X), then apply:

sudo netplan apply

## 3. Bridged Adapter

### ****How It Works:****

* **Bridged Networking:**  
  The VM connects directly to the same physical network as your Windows host. All devices (including the VM) are visible on that same network.
* **No DHCP Environment:**  
  If your network (or router) isn’t providing DHCP, then every device—including your VM—must be assigned a static IP.

### ****Static IP Configuration:****

* **On Your Windows Host:**  
  Assume the host has a static IP (for example, 192.168.1.10).
* **On Your Ubuntu VM:**  
  Assign an IP from the same subnet (for example, 192.168.1.15).

### ****Example (Ubuntu with Netplan):****

1. **Open the Netplan Configuration:**

sudo nano /etc/netplan/01-netcfg.yaml

network:

version: 2

ethernets:

enp0s3:

addresses:

- 192.168.1.15/24

gateway4: 192.168.1.1

nameservers:

addresses: [8.8.8.8, 8.8.4.4]

sudo netplan apply

### ****1️⃣ Install & Enable SSH on Ubuntu****

Run these commands on your Ubuntu server:

sudo apt update

sudo apt install openssh-server -y

sudo systemctl enable ssh

sudo systemctl start ssh

sudo systemctl status ssh

sudo ufw allow ssh

sudo ufw enable

sudo ufw status  
  
ssh -vvv your\_username@server\_ip