Remote Desktop Into Kali Linux from an External Network

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The following tutorial details the steps and hardware required to allow remote access to a local machine while connected to an external network. All requirements are based upon the tools used to conduct the setup contained herein. There are likely other methods to achieve similar results (without relying upon third-party tools such as TeamViewer or Chrome Remote Desktop), but they are unknown to me at the time of this writing.

Background

Tired of seeing an old, but perfectly capable, gaming computer collect dust in my closet I started thinking about repurposing it. After briefly considering turning it into a FreeNAS based home server, I settled upon converting it into a dedicated Kali machine from which I could further explore the world of cyber security and ethical hacking.

As a minimalist who despises a cluttered desk I had no desire to add an additional mouse, keyboard, nor monitor to my work area. This issue was quickly solved by accessing the Kali machine via Remote Desktop Protocol (RDP) and FreeRDP.

A few weeks after the initial RDP setup, I came across a term previously unknown to me while reading through the CISSP Exam Guide. That term was Wake-on-LAN (WoL). Without getting into the technical details, WoL is a standard protocol that allows you to send a network message referred to as a ‘magic packet’ to wake a computer from a low power state. The caveat to WoL as the name implies, is that the

computer sending the magic packet must be connected to the same local area network as the computer receiving it.

Enjoying the ability to use my laptop to turn on and access my Kali workstation from anywhere while connected to my home network, I began to research the possibility of performing the same actions from anywhere- regardless of the network I am connected to. After several days of research it turns out that it is totally possible!

Hardware Requirements

- Internet facing Kali Linux desktop with a hardwired Ethernet connection to your home router.
- Laptop with Linux OS (referred to herein as the **client**).
- Raspberry Pi 4.

Enable Wake-on-LAN on Kali Desktop

The following steps should be considered a general outline as the exact steps will vary depending on the device's motherboard.

1. As you boot your computer press the correct key to access the BIOS (F2, ESC, Delete, or other).
2. Navigate to the Advanced or Power Management tab of your BIOS.
3. Look for the correct option to enable Wake-on-LAN or "Power On By PCIE/PCI".

Sample of Wake-on-LAN being enabled in the BIOS. The physical appearance and terminology used will be slightly different depending on the motherboard.

Configure Raspberry Pi as a Wake-on-LAN Server

SSH Setup

Setting up your Raspberry Pi server is a simple process thanks to detailed guides created by the Raspberry Pi Foundation. It is very important to set up the Pi correctly as the configuration described in this tutorial directly exposes the device to the internet. Further, the set up requires the device to be accessed via SSH protocol which will inherently expose the device to potential risks.

As the initial setup of the SSH server is thoroughly covered by the Raspberry Pi Foundation I will not reiterate their instructions which can be found on their website here.

IMPORTANT NOTE: When completing the "Using key-based authentication" section of the Raspberry Pi Foundation guide any references to the client device will be completed on your laptop, not your Kali workstation.

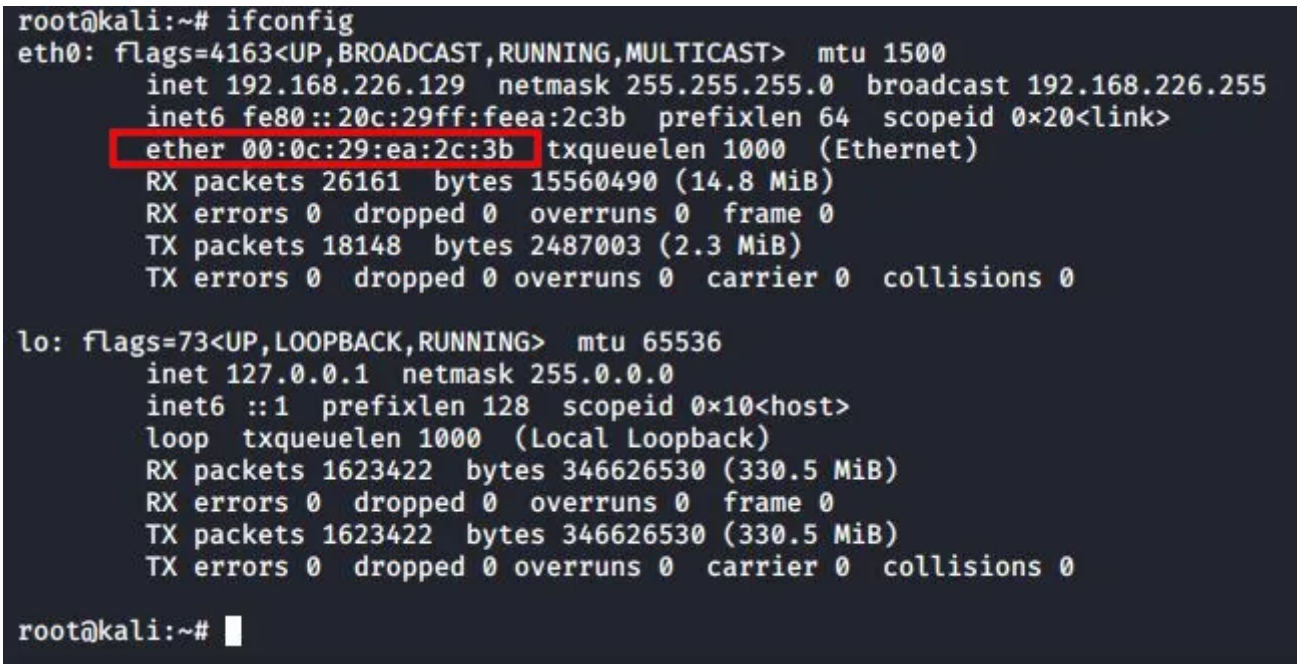
Wake-on-LAN Setup

1. Install ‘wakeonlan’ on your Raspberry Pi server using the following terminal command:

```
sudo apt-get install wakeonlan
```

2. Get the MAC address of your Kali desktop using the following terminal command:

```
sudo ifconfig
```



The MAC address is the 48-bit string following the word ‘ether’ under the eth0 interface highlighted in red above (Original image from https://www.linuxnix.com/8-examples-of-using-ipconfig-command/).

Test Wake-on-LAN Server

1. SSH into Raspberry Pi from the **client** laptop.

```
ssh pi@<ip-address>
```

Where <ip-address> is the IP address of your Pi device.

2. From the Raspberry Pi send a magic packet to the **Kali** workstation.

```
wakeonlan <MAC-address>
```

Where <MAC-address> is the MAC address of the Kali workstation found using ifconfig.

Configure Remote Desktop Protocol

Enable Remote Desktop on Kali Linux

From the Kali terminal run the following commands:

1. Install the Xrdp server (an open-source version of Microsoft's RDP server).

```
sudo apt-get install xrdp
```

2. Start the Xrdp server.

```
sudo systemctl start xrdp
```

3. Start the Xrdp session manager.

```
sudo systemctl start xrdp-sesman
```

Install FreeRDP

FreeRDP is a free Remote Desktop Protocol client that will allow you to interact with your Kali workstation through a GUI as if you were sitting at the machine itself. Check out FreeRDP's wiki here for more information and detailed configuration options.

Install FreeRDP on the client laptop using the following command(s):

Ubuntu:

```
sudo apt-get update
sudo apt-get install freerdp
```

Arch:

```
sudo pacman -S freerdp
```

Test FreeRDP to Kali from Client

Before completing the following steps make sure the Kali user is logged off or you may receive a 'login failed' error.

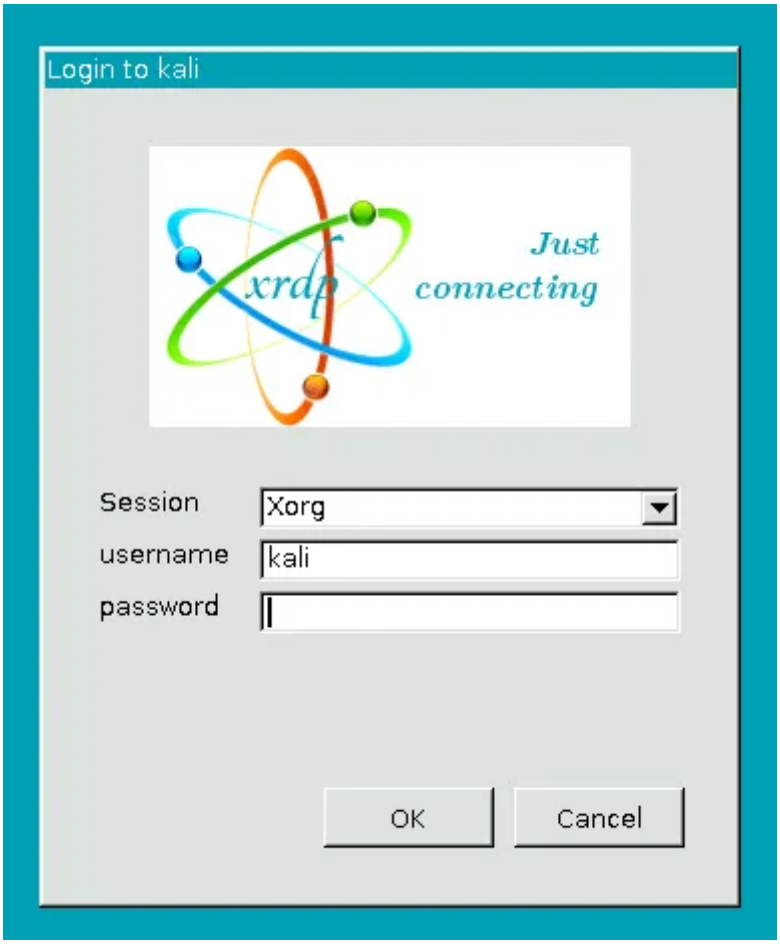
From the client terminal run the command:

```
xfreerdp /v:<IP-address> /u:<username>
```

Where <IP-address> is the IP address of the Kali desktop and <username> is the username to be access on the Kali workstation.

When the xrdp window opens before pressing 'OK':

1. Change the session type to Xorg.
2. Confirm that the username is correct.
3. Enter the appropriate password.



Preview of the xrdp login screen after running the xfreerdp command.

> If you were to stop here everything would appear to work correctly while connected to your local network, BUT as soon as you connect to a different network you would find that you are unable to access the home devices! In order to connect to your home network from an external/public network a few more steps are required.

Configure the OpenVPN Server

Home Router Setup

This process will be different depending on your router model, so I will only provide an overview of the steps required.

Using your favorite search provider look up how to enable an OpenVPN server on your home network. A good place to start this search is on your device manufacturer's website. In general you will want to:

1. Configure a Dynamic DNS service.

This is important because internet service providers use dynamically assigned IP addresses, meaning they can be changed at any time. It would be a shame to spend the time enabling remote access to your workstation, only to find it inaccessible because your IP address had changed. The Dynamic DNS Service allows you to connect to your home network using the domain name while automatically finding your network's current IP address.

2. Set up an OpenVPN server on your router.

3. Export the OpenVPN (**.ovpn**) configuration file from your router to the client laptop that will be used to access both the Raspberry Pi SSH server, and Kali workstation.

Client Laptop Setup

To access your home network from an external network requires the use of OpenVPN in conjunction with the OpenVPN server set up on your home router above.

To install OpenVPN on the client laptop enter the following command in the terminal:

Ubuntu:

```
sudo apt-get install openvpn
```

Arch:

```
pacman -S networkmanager-openvpn
```

To establish a connection to the OpenVPN server established on the home router enter the following command in the terminal:

```
sudo openvpn /path/to/file.ovpn
```

Where /path/to/file.ovpn is the file exported in step 3 of ***Home Router Setup*** *above.*

Accessing Your Remote Desktop from a Public Network — FINALLY!

While not absolutely necessary, it is a good idea to test that everything works in a controlled setting before relying upon your configuration.

One way to simulate accessing your home network from an external device is disconnecting the client laptop from your home WiFi, and then using your mobile phone as a WiFi hot spot.

Once connected to an external network, enter the following commands in the client terminal to access the Kali workstation remotely:

1. Connect to the OpenVPN server.

```
sudo openvpn /path/to/file.ovpn
```

2. SSH into the Raspberry Pi server

```
ssh pi@<ip-address>
```

3. (From the Pi SSH server) Wake the Kali workstation

```
wakeonlan <MAC-address>
```

Be sure to wait a few seconds before attempting to access the remote desktop. The length of time required will vary depending upon the time it takes for your remote machine to boot.

4. (From the client laptop) RDP into the Kali workstation.

```
xfreerdp /v:<IP-address> /u:<username>
```

If everything works as it should, you will now be connected to your local Kali workstation on your home network!

Final Thoughts

The Kali workstation referenced in this guide can be replaced with any other Linux based operating system you may wish to connect- just change the terminal commands accordingly. It's also possible to streamline your final connection work flow using a combination of bash functions and aliases depending on personal preference, but that's beyond the scope of this guide.

Please feel free to leave any thoughts, concerns, or constructive criticism in the comments!

Resources

https://forums.kali.org/showthread.php?46345-Enabling-Remote-Desktop-and-SSH-access-to-Kali

https://www.howtogeek.com/70374/how-to-geek-explains-what-is-wake-on-lan-and-how-do-i-enable-it/

https://www.linuxnix.com/8-examples-of-using-ipconfig-command/

https://www.raspberrypi.org/documentation/configuration/security.md

Ssh Kali Linux Openvpn Raspberry Pi