

Setting up the CTF VM

Step 0 - Prerequisites:

In order to play the CTF, you will need to have a Virtual Machine Manager installed. The setup script will work in Kali, which should be able to run in any Virtual Machine Manager. Some of the most popular Virtual Machine Managers include:

- Virtual Box [FREE] - <https://www.virtualbox.org/wiki/Downloads>

Warning

DOES NOT WORK ON MACOS

- VMware Workstation Pro (Windows/Linux) or VMware Fusion (Mac OS) [FREE] - <https://blogs.vmware.com/cloud-foundation/2024/05/13/vmware-workstation-pro-now-available-free-for-personal-use/>
- MacOS Parallels [PAID only] - <https://www.parallels.com/>
- Virtual Manager, Gnome Boxes, etc. [LINUX only] - Install via your repo

Note

If you already have a Kali VM set up, then you can skip down to **Step 2 - Install Kali** in these instructions.

If you have a dedicated Kali installed on laptop (bare metal), then you can skip to **Step 3 - Run the setup script** in these instructions.

VMWare Fusion

To ensure first-time CTF players have a working Virtual Machine Manager, we have provided the following instructions for VMware Fusion, which is free. You will need to register on the Broadcom website (they own VMware).

If you do not like providing your information to Broadcom, the only other options are not free.

Note

If you already have a Kali VM set up, then you can skip down to **Step 2 - Install Kali** in these instructions.

If you have a dedicated Kali installed on laptop (bare metal), then you can skip to **Step 3 - Run the setup script** in these instructions.

To register with on the Broadcom site:

- Go to the following VMware site: <https://blogs.vmware.com/teamfusion/2024/05/fusion-pro-now-available-free-for-personal-use.html>
- Look for the download link for VMware Fusion (about 1/3 down the page) and click it:

Pro Apps are now Free for Personal Use and Licensed for Commercial Use

The most exciting part is that Fusion Pro and Workstation Pro will now have two license models. We now provide a Free Personal Use or a Paid Commercial Use subscription for our Pro apps. Users will decide based on their use case whether a commercial subscription is required.

This means that everyday users who want a virtual lab on their Mac, Windows or Linux computer can do so *for free* simply by registering and downloading the bits from the new download portal located at support.broadcom.com

[VMware Fusion Pro Download](#)

[VMware Workstation Pro Download](#)

- This will open up the Broadcom site for the download. If you don't already have an account, click the Login link in the upper right of the page, then select the register button:

BROADCOM PRODUCTS SOLUTIONS SUPPORT COMPANY HOW TO BUY

LOGIN

myBroadcom Account:
LOGIN REGISTER
Forgot Username/Password?

Having trouble logging in? [Click here](#) to use our Chat Bot for assistance.

Connecting to Support Portal ECX

BROADCOM

Broadcom Inc. Customer sign-in

Username
Enter your username

☐ Remember me

Next


- On the User Registration page, enter your email:

User Registration

Create your Account


Email Address

name@company.com



Enter text from image

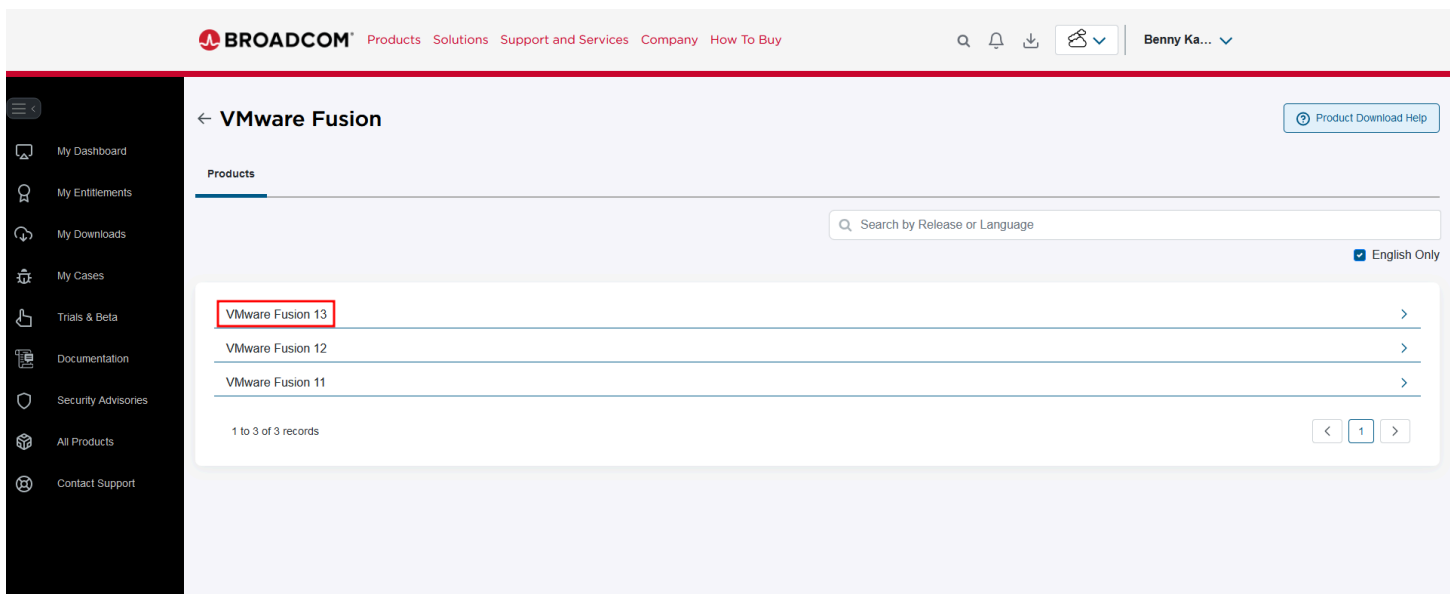
Next

 Use of a shared email account or a distribution list (PDL) is a security risk and a violation of the **Terms of Use** for this Site.

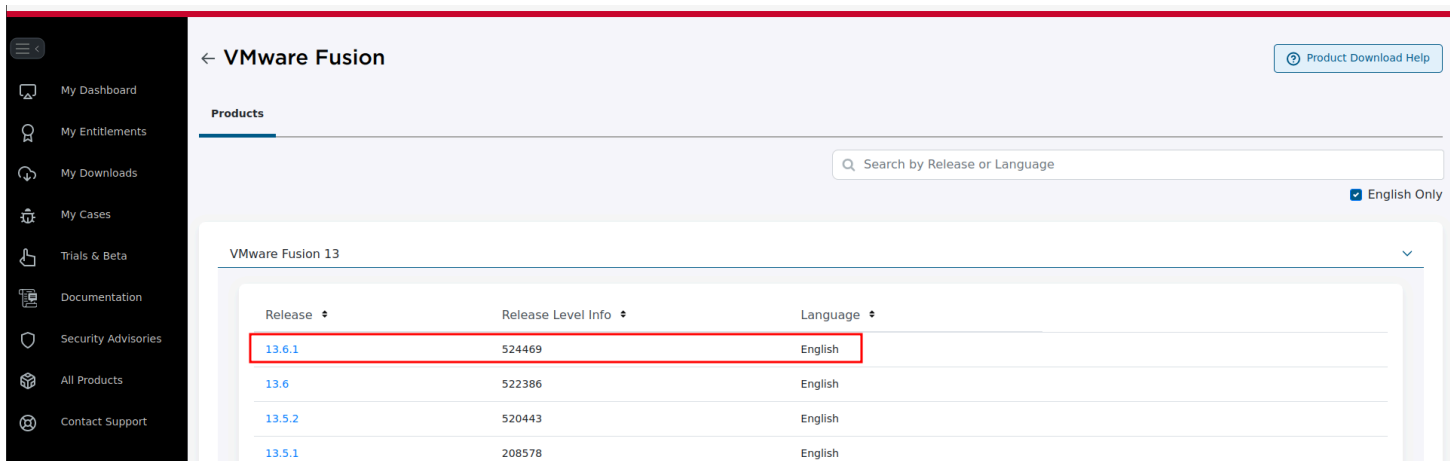
Having trouble? **Ask our chatbot** for assistance.

- You will then have to finish the user account. Once your account is created, then you can go and download the software.
- After logging into the Broadcom site, go to the Fusion Download page:
<https://support.broadcom.com/group/ecx/productdownloads?subfamily=VMware%20Fusion&freeDownloads=true>

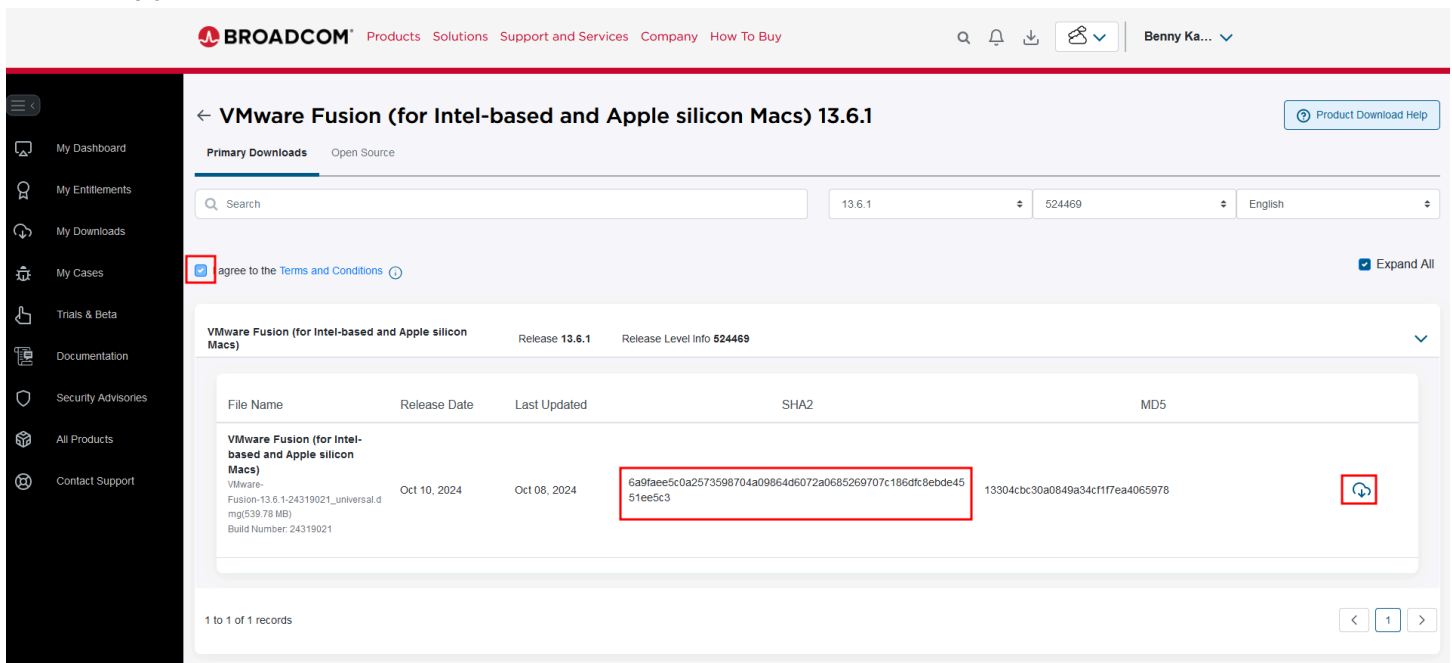
- Select VMware Fusion 13:



- Then, click on the latest release (which is 13.6.1 at the time of this documentation):



- Click on the I agree to the Terms and Conditions and then click on the Download button. Also, copy the SHA256 check sum for reference later.



Step 1 - Install VMware Fusion:

- ☐ Download the required DMG file (from above)
- ☐ Do CheckSums for the DMG
 - If you are unsure how to do this, see the appendix below
- ☐ Install VMware normally (Next, next, etc.)
- ☐ You are now ready for **Step 2 - Install Kali**.

Step 2 - Install Kali:

Fresh_Kali_Install_ISO-AppleSilicon-VMware

Kali inside VMware Fusion (Guest VM)

Note

For latest versions, see <https://www.kali.org/get-kali/#kali-installer-images>

This guide is about virtualizing Kali Linux inside of VirtualBox, allowing you to have a Kali VM. This is a great way to use Kali, as it is completely separate from the host, allows you to interact with other VMs (as well as the host machine and other machines on the network), and allows you to revert to snapshots.

You may wish to follow our other guide if you are trying to install VirtualBox on Kali Linux (as a [host](#)).

The guide below is what we use to generate our [pre-made Kali Linux VirtualBox images](#). You may alter this to your needs. We always generate the images using the [latest version of VirtualBox](#).

Note

You may need to enable virtualization in your BIOS/UEFI for (e.g. Intel VT-x/AMD-V)

If you are on Apple Silicon, which is Arm64, then choose the Apple Silicon ISO:



VMware Fusion New Machine Wizard

After installing VMware Fusion 13, and opening the application for the first time, it forces the user to create a new machine. Once you've created your machine, if you would like to create another you will need to select "create new machine" from the options.

Open the directory in which the .iso was saved after downloading. Drag the freshly downloaded .iso to the window and begin the installation (Debian 12.x 64-bit Arm). We can also just simply click on "install from disk or image", or "use another disc, or disc image" option from the VMware Fusion application window.

Select the Installation Method



Install from disc or image

Drag your ISO file here to start installing



Create a custom
virtual machine



Get Windows
from Microsoft

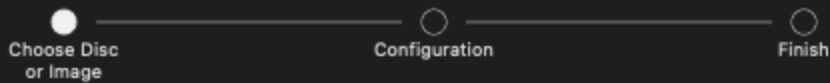


Cancel

Continue

Create a New Virtual Machine

This will guide you through installing Windows or another operating system in a virtual machine on your Mac.



Choose an operating system installation disc or image:



kali-linux-2023.3-installer-arm64.iso

Show in Finder

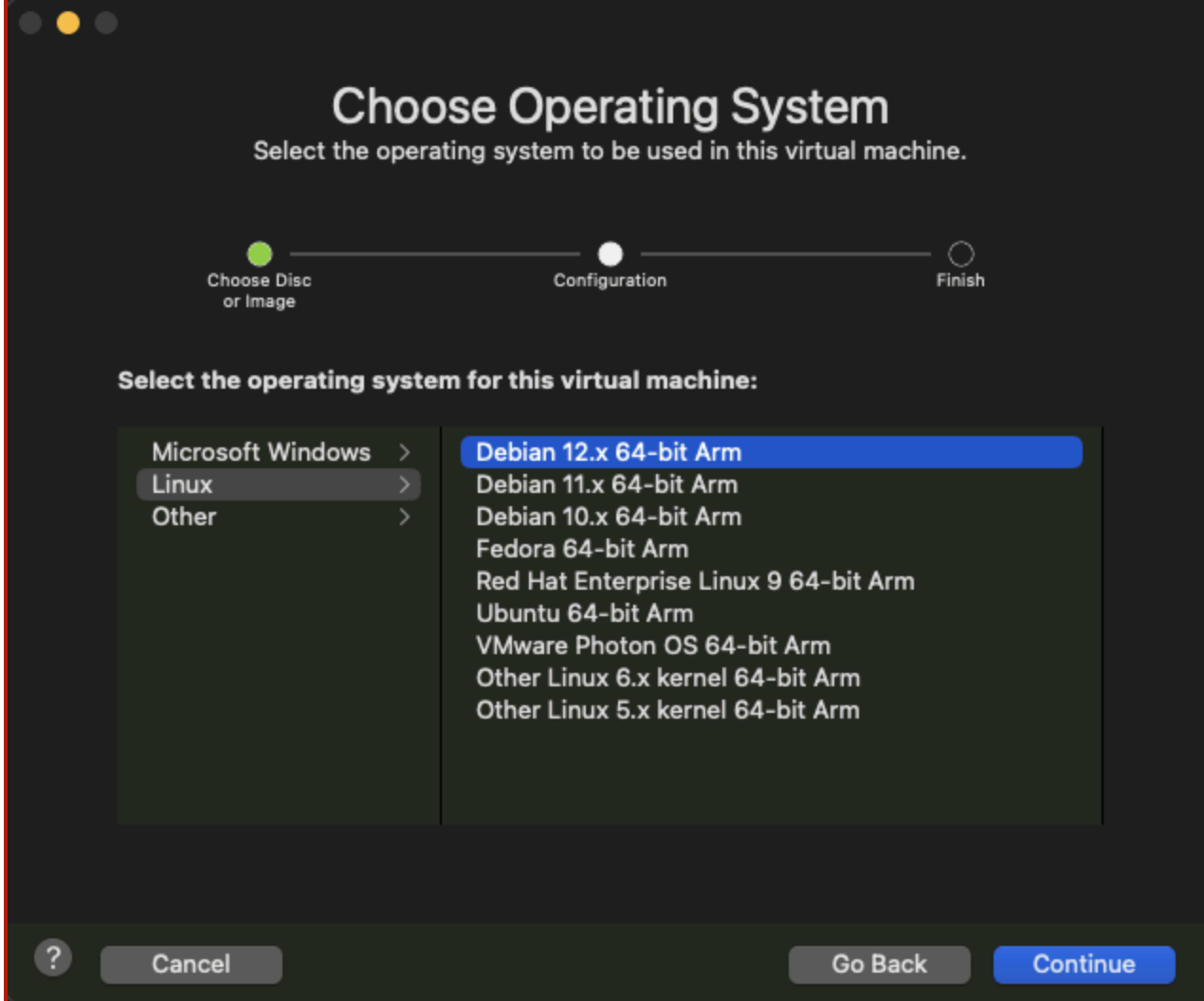
Use another disc or disc image...



Cancel

Go Back

Continue

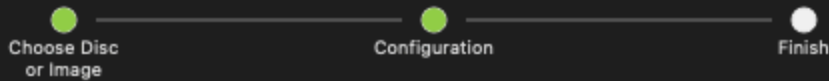


Note

In the configuration section (not pictured), you can change the Hard Drive size to 80 GB if you have the HD space on your Apple Laptop. You should also be able to change the RAM size for the kali VM to 4GB, again, if you have the RAM to support it on your Apple Laptop.

Finish

The configuration of the virtual machine is now complete.



Virtual Machine Summary

Guest Operating System Debian 12.x 64-bit Arm

New Hard Disk Capacity 20 GB

Memory 2 GB

Networking Share with my Mac (NAT)

Device Summary 2 CPU cores, CD/DVD, USB Controller, Sound Card

To change the default virtual machine settings, click Customize Settings. To run the virtual machine now, click Finish.

Customize Settings



Cancel

Go Back

Finish

After all this is done, we save, start up the VM, and then continue installing Kali Linux as we normally would for a bare metal install (see below).

Installing Kali Linux

Note

For latest, see <https://www.kali.org/docs/installation/hard-disk-install/>

Boot

1. To start your installation, boot with your chosen installation medium. You should be greeted with the Kali Linux Boot screen. Choose either **Graphical install** or **Install** (Text-Mode). In this example, we chose the Graphical install.



Kali Linux installer menu (BIOS mode)

Graphical install

- Install
- Advanced options >
- Accessible dark contrast installer menu >
- Help
- Install with speech synthesis

If you're using the **live** image instead, you will see another mode, **Live**, which is also the default boot option.



Boot menu

Live (amd64)

- Live (amd64 failsafe)
- Live (forensic mode)
- Live USB Persistence (check kali.org/prst)
- Live USB Encrypted Persistence (check kali.org/prst)
- Graphical install
- Install
- Install with speech synthesis
- Advanced options >

Language

2. Select your preferred language. This will be used for both the setup process and once you are using Kali Linux.



Select a language

Choose the language to be used for the installation process. The selected language will also be the default language for the installed system.

Language:

| | | |
|-----------------------|---|------------|
| Chinese (Simplified) | - | 中文(简体) |
| Chinese (Traditional) | - | 中文(繁體) |
| Croatian | - | Hrvatski |
| Czech | - | Čeština |
| Danish | - | Dansk |
| Dutch | - | Nederlands |
| Dzongkha | - | ཇོངཀཤ |
| English | - | English |
| Esperanto | - | Esperanto |
| Estonian | - | Eesti |
| Finnish | - | Suomi |
| French | - | Français |
| Galician | - | Galego |
| Georgian | - | ქართული |
| German | - | Deutsch |

Screenshot

Go Back

Continue

3. Specify your geographic location.

Select your location

The selected location will be used to set your time zone and also for example to help select the system locale. Normally this should be the country where you live.

This is a shortlist of locations based on the language you selected. Choose "other" if your location is not listed.

Country, territory or area:

India
Ireland
Israel
New Zealand
Nigeria
Philippines
Seychelles
Singapore
South Africa
United Kingdom
United States
Zambia
Zimbabwe
other

Screenshot

Go Back

Continue

4. Select your keyboard layout.

Configure the keyboard

Keymap to use:

American English

Albanian

Arabic

Asturian

Bangladesh

Belarusian

Bengali

Belgian

Bosnian

Brazilian

British English

Bulgarian (BDS layout)

Bulgarian (phonetic layout)

Burmese

Canadian French

Canadian Multilingual

Catalan

Screenshot

Go Back

Continue

Network

5. The setup will now probe your network interfaces, looks for a DHCP service, and then prompt you to enter a hostname for your system. In the example below, we've entered **kali** as our hostname.

If there is no network access with DHCP service detected, you may need to manually configure the network information or do not configure the network at this time.

- If there isn't a DHCP service running on the network, it will ask you to manually enter the network information after probing for network interfaces, or you can skip.
- If Kali Linux doesn't detect your NIC, you either need to include the drivers for it when prompted, or generate a **custom Kali Linux ISO** with them pre-included.
- If the setup detects multiple NICs, it may prompt you which one to use for the install.
- If the chosen NIC is 802.11 based, you will be asked for your wireless network information before being prompted for a hostname.

Configure the network

Please enter the hostname for this system.

The hostname is a single word that identifies your system to the network. If you don't know what your hostname should be, consult your network administrator. If you are setting up your own home network, you can make something up here.

Hostname:

Screenshot

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Continue

-
6. You may optionally provide a default domain name for this system to use (values may be pulled in from DHCP or if there is an existing operating systems pre-existing).

Configure the network

The domain name is the part of your Internet address to the right of your host name. It is often something that ends in .com, .net, .edu, or .org. If you are setting up a home network, you can make something up, but make sure you use the same domain name on all your computers.

Domain name:

Screenshot

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Continue

User Accounts

7. Next, create the user account for the system (Full name, username and a strong password).

Set up users and passwords

A user account will be created for you to use instead of the root account for non-administrative activities.

Please enter the real name of this user. This information will be used for instance as default origin for emails sent by this user as well as any program which displays or uses the user's real name. Your full name is a reasonable choice.

Full name for the new user:

Screenshot

Go Back

Continue

Set up users and passwords

Select a username for the new account. Your first name is a reasonable choice. The username should start with a lower-case letter, which can be followed by any combination of numbers and more lower-case letters.

Username for your account:

Screenshot

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Continue

Set up users and passwords

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

Choose a password for the new user:

☐ Show Password in Clear

Please enter the same user password again to verify you have typed it correctly.

Re-enter password to verify:

☐ Show Password in Clear

Screenshot

Go Back

Continue

Clock

8. Next, set your time zone.

Configure the clock

If the desired time zone is not listed, then please go back to the step "Choose language" and select a country that uses the desired time zone (the country where you live or are located).

Select your time zone:

Eastern

Central

Mountain

Pacific

Alaska

Hawaii

Arizona

East Indiana

Samoa

Screenshot

Go Back

Continue

Disk

9. The installer will now probe your disks and offer you various choices, depending on the setup.

In our guide, we are using a clean disk, so we have four options to pick from. We will select **Guided - the entire disk**, as this is the single boot installation for Kali Linux, so we do not want any other operating systems installed, so we are happy to wipe the disk.

If there is an pre-existing data on the disk, you will have have an extra option (*Guided - use the largest continuous free space*) than the example below. This would instruct the setup not to alter any existing data, which is perfect for dual-booting into another operating system. As this is not the case in this example, it is not visible.

Experienced users can use the "Manual" partitioning method for more granular configuration options, which is covered more in our [BTRFS guide](#).

If you want to encrypt Kali Linux, you can enable Full Disk Encryption (FDE), by selecting **Guided - used entire disk and setup encrypted LVM**. When selected, later on in the setup (not in this guide) prompt you to enter a password (twice). You will have to enter this password every time you start up Kali Linux.



Partition disks

The installer can guide you through partitioning a disk (using different standard schemes) or, if you prefer, you can do it manually. With guided partitioning you will still have a chance later to review and customise the results.

If you choose guided partitioning for an entire disk, you will next be asked which disk should be used.

Partitioning method:

Guided - use entire disk

Guided - use entire disk and set up LVM

Guided - use entire disk and set up encrypted LVM

Manual

Screenshot

Go Back

Continue

10. Select the disk to be partitioned.

Partition disks

Note that all data on the disk you select will be erased, but not before you have confirmed that you really want to make the changes.

Select disk to partition:

SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S

Screenshot

Go Back

Continue

11. Depending on your needs, you can choose to keep all your files in a single partition - the default - or to have separate partitions for one or more of the top-level directories.

If you're not sure which you want, you want "**All files in one partition**".

Partition disks

Selected for partitioning:

SCSI3 (0,0,0) (sda) - VMware, VMware Virtual S: 21.5 GB

The disk can be partitioned using one of several different schemes. If you are unsure, choose the first one.

Partitioning scheme:

All files in one partition (recommended for new users)

Separate /home partition

Separate /home, /var, and /tmp partitions

Screenshot

Go Back

Continue

Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning

Configure software RAID

Configure the Logical Volume Manager

Configure encrypted volumes

Configure iSCSI volumes

SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S

| | | | | | | |
|---|----|---------|---------|---|------|------|
| > | #1 | primary | 20.4 GB | f | ext4 | / |
| > | #5 | logical | 1.0 GB | f | swap | swap |

Undo changes to partitions

Finish partitioning and write changes to disk

Screenshot

Help

Go Back

Continue

- Next, you'll have one last chance to review your disk configuration before the installer makes irreversible changes. After you click *Continue*, the installer will go to work and you'll have an almost finished installation.

Partition disks

If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #2 of SCSI3 (0,0,0) (sda) as ext4
partition #5 of SCSI3 (0,0,0) (sda) as swap

Write the changes to disks?

☐ No

☒ Yes

Screenshot

Continue

Encrypted LVM

If enabled in the previous step, Kali Linux will now start to perform a secure wipe of the hard disk, before asking you for a LVM password.

Please be sure a strong password is used, or else you will be prompted with a weak passphrase warning.

This wipe may take “a while” (hours) depending on the size and speed of the drive. If you wish to risk it, you can skip it.

Proxy Information

13. Kali Linux uses a central repository to distribute applications. You'll need to enter any appropriate proxy information as needed.

Configure the package manager

If you need to use a HTTP proxy to access the outside world, enter the proxy information here. Otherwise, leave this blank.

The proxy information should be given in the standard form of "http://[[user][:pass]@]host[:port]/".

HTTP proxy information (blank for none):

Screenshot

Go Back

Continue

Metapackages

If network access was not setup, you will want to **continue with setup** when prompt.

If you are using the **Live** image, you will not have the following stage.

14. Next you can select which **metapackages** you would like to install. The default selections will install a standard Kali Linux system and you don't really have to change anything here.

Please **refer to this guide** if you prefer to change the default selections.

Software selection

At the moment, only the core of the system is installed. The default selections below will install Kali Linux with its standard desktop environment and the default tools.

You can customize it by choosing a different desktop environment or a different collection of tools.

Choose software to install:

- ☒ Desktop environment [selecting this item has no effect]
- ☒ ... Xfce (Kali's default desktop environment)
- ☐ ... GNOME
- ☐ ... KDE Plasma
- ☒ Collection of tools [selecting this item has no effect]
- ☒ ... top10 -- the 10 most popular tools
- ☒ ... default -- recommended tools (available in the live system)
- ☐ ... large -- default selection plus additional tools

Screenshot

Continue

Boot Information

15. Next confirm to install the GRUB boot loader.

Install the GRUB boot loader

It seems that this new installation is the only operating system on this computer. If so, it should be safe to install the GRUB boot loader to your primary drive (UEFI partition/boot record).

Warning: If your computer has another operating system that the installer failed to detect, this will make that operating system temporarily unbootable, though GRUB can be manually configured later to boot it.

Install the GRUB boot loader to your primary drive?

☐ No

☒ Yes

Screenshot

Go Back

Continue

-
16. Select the hard drive to install the GRUB bootloader in (**it does not by default select any drive**).

Install the GRUB boot loader

You need to make the newly installed system bootable, by installing the GRUB boot loader on a bootable device. The usual way to do this is to install GRUB to your primary drive (UEFI partition/boot record). You may instead install GRUB to a different drive (or partition), or to removable media.

Device for boot loader installation:

Enter device manually

/dev/sda

Screenshot

Go Back

Continue

Reboot

17. Finally, click Continue to reboot into your new Kali Linux installation.

Finish the installation



Installation complete

Installation is complete, so it is time to boot into your new system. Make sure to remove the installation media, so that you boot into the new system rather than restarting the installation.

Screenshot

Go Back

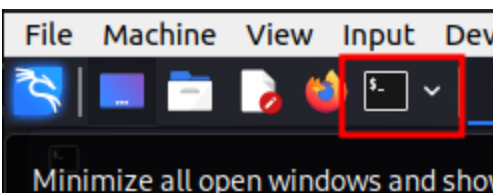
Continue

Post Installation

Now that you've completed installing Kali Linux, it's time to customize your system, but before the next steps, take a snapshot of the VM before going further.

Step 3 - Run the setup script:

- Start the new Kali VM
- Log into fresh Kali VM using the creds you set up from above:
- Open the Terminal
 - The button can be found in the upper left of the desktop:



- The following commands will need to be run from within the terminal:

⚠ Warning

If you copy from the PDF, you may need to fix the lines in a text file first before using it in the terminal (it may chop it up in the copy). Copy it, then paste into you're favorite text editor and then re-copy it.

```
mkdir Projects && cd Projects && git clone  
https://github.com/bkarnes/hack3rcon_ctf.git && cd hack3rcon_ctf && chmod u+x  
setup_vm.sh && ./setup_vm.sh
```

Explanation of the above commands:

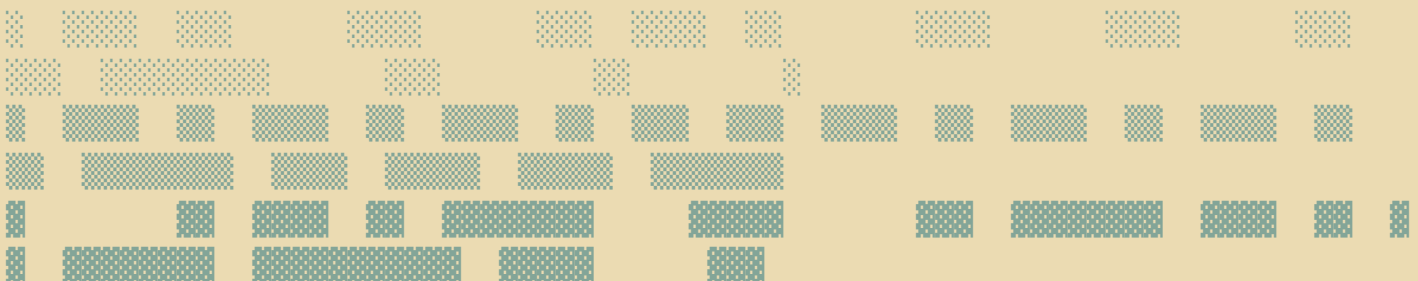
- We make a Projects directory in kali's home directory:
`mkdir Projects`
- We then change into the Projects directory
`cd Projects`
- We clone my Repo:
`git clone https://github.com/bkarnes/hack3rcon_ctf.git`
- We then change into the LinuxAdminClass directory that is created:
`cd hack3rcon_ctf`
- We make the setup_vm.sh script executable:
`chmod u+x setup_vm.sh`
- We then run the script:
`./setup_vm.sh`

Running the Script:

⚠ Warning

The script has only been tested on Kali, but may not work on ParrotOS.
Also, use the user creds you set above instead of the kali creds from the VM
To restart the script after the first step, run the following:

```
./Projects/hack3rcon_ctf/setup_vm.sh
```



Today is: Sat May 24 02:08:09 PM EDT 2025

What can I do for you today?

- 1) Setup CLI logging and default directories. Will require a reboot.
- 2) Update VM. Will reboot after update.
- 3) Install Docker. Will reboot after install.
- 4) Install netbird client. Will reboot after install.
- 5) Install Project Discovery Tools.(Optional) Will reboot after install.

(Q)uit

- Now, perform the following actions in the following order (reboot as needed):

Note

The VM will reboot after each step

1. Setup CLI logging.

You will need to put in kali's password twice

2. Update VM.

This step is optional if you've already updated your VM this before running the script or can be done after other steps are completed.

This could take a long time depending on your Internet speed and HD. Plus, you may need to watch it a bit as you will need to put in kali's password a couple of times and maybe answer a question or two.

3. Install Docker.

4. Skip the netbird client step as you will set it up below (due to the Arm architecture).

- You will use a netbird setup key below

5. Install the Project Discovery tools if you would like (not required for the CTF)

Warning

You will need to enter the user's creds to reboot after this step is finished.

- Quit out of the script and run the following to install the netbird agent:

```
curl -fsSL https://pkgs.netbird.io/install.sh | sh
```

Step 4 - Test the setup:

- Reboot it one last time and run the following tests:

- ☐ Ensure that the kali user has the BASH shell loaded:

```
(kali@kali)~$ echo $SHELL
/bin/bash
```

- If you don't see **/bin/bash** like above, then run the following command:
`chsh -s /bin/bash`
- Reboot the VM and rerun the echo command from above to ensure it says **/bin/bash**.

- ☐ Check to make sure Netbird installed properly:

```
(kali@kali)~$ netbird version
0.29.1
```

Your version may be newer.

- ☐ Make sure netbird is not connected to any network and then connect it to the CTF network:

```
(kali@kali)~$ netbird down
Disconnected
```

```
(kali@kali)~$ sudo netbird up --setup-key 61321F92-BF18-4D44-A6EB-9E72C84D9ABD
[sudo] password for kali:
Connected
```

Step 5 - Playing the CTF:

- To play the CTF this year, you will work from your VM and connect to the servers in the CTF Network using Netbird. The scoreboard will be available the day of the event so teams can sign up on Friday, Oct. 24th, starting at 9 am.

Appendix

Doing Check Sums on downloaded files:

After downloading the following files, you will need to do a check sum on the file to ensure it is exactly as the one on the server. To do that, select one of the following to run the checksums:

Check Sums (Windows):

- File Checksum & Integrity Check on Windows 10 - File Security [Hash SHA-1/256/384/512/MD5] - <https://www.youtube.com/watch?v=UrHhsF1q3rU>
- Verifying a SHA Checksum on Windows 10 - <https://www.youtube.com/watch?v=6Xpmku3kwjo>
- Use the following command for checking the sums on windows:

```
certutil -hashfile "filename.zip" sha256
```

Check Sums (MacOS):

Verifying a SHA Checksum on a Mac is the same as the Linux Commands below due to their similar nature.

Check Sums (Linux):

```
echo "sha256 hash line" | shasum -a 256 --check
```

Example:

```
echo "6a9faee5c0a2573598704a09864d6072a0685269707c186dfc8ebde4551ee5c3  
VMware-Fusion-13.6.1-24319021_universal.dmg" | shasum -a 256 --check
```

Result:

```
VMware-Fusion-13.6.1-24319021_universal.dmg: OK
```

Alternatives ways to do it on the CommandLine:

```
shasum -a 256 SecureWV-PlayerVM.7z
```

```
sha256sum VMware-Fusion-13.6.1-24319021_universal.dmg  
6a9faee5c0a2573598704a09864d6072a0685269707c186dfc8ebde4551ee5c3  VMware-  
Fusion-13.6.1-24319021_universal.dmg
```

Then you will need to compare with the number from the website.