CS 455 – Computer Security Fundamentals

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- More about the Vulnerability
- Introduction to Kali Linux
- Install Kali Linux
- Hands-on for Kali Linux
- Let’s do some Footprinting job. Shall we? ^_^

More about the Vulnerability

- Not all the systems are perfect
- This is not limited to the computer systems.
  - It could be anything, including your **peripherals**. For example, any hardware that are driven by firmware.
    - Your camera may betray you by sending your picture to someone
    - Your printer might get a Trojan so someone knows what are the documents you are printing
    - Even worse, are you sure the WiFi AP in your house is only used by you and your roommate?
      - Checkout this crazy hacker's video in the YouTube (how Hackers crack any WiFi password?! set strong WiFi password now!)
      - https://www.youtube.com/watch?v=QGzTCL1KkeY
    - I don't care how he cracked the password but one thing caught our eyes. Yes! The system! What is the OS this guy using!? Kali Linux!

Introduction to Kali Linux

- Kali Linux is a Debian-derived Linux distribution designed for digital forensics and penetration testing
- We can overly simplified that as a Debian Linux + tons of computer security related tool
- Getting Excited? Let’s see how to install Kali Linux
- We will use this as our working environment for a while. Since this is the early weeks, let’s get our hands dirty

Install Kali Linux

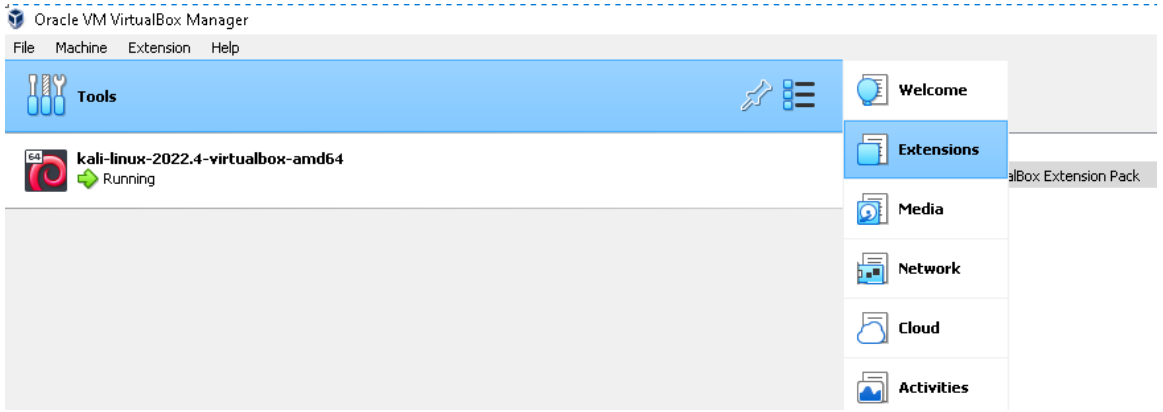
- The way to install and configure Kali Linux are many
- If you have a spare laptop / desktop, you can use download the system image and flash into a USB drive. Then, you can boot from the USB drive and follow the regular installation
- If you have a Raspberry Pi (ARM based), the Kali Linux distribution image supports Raspberry Pi zero, 1, 2, 3 and 4!
- For Intel platform laptop / desktop, it has 32 bit and 64 bit versions
- For mobile phones, you can even install Kali Linux onto your Android phones!
- If you want, you can even setup a dual boot to have your Windows co-existing with Kali

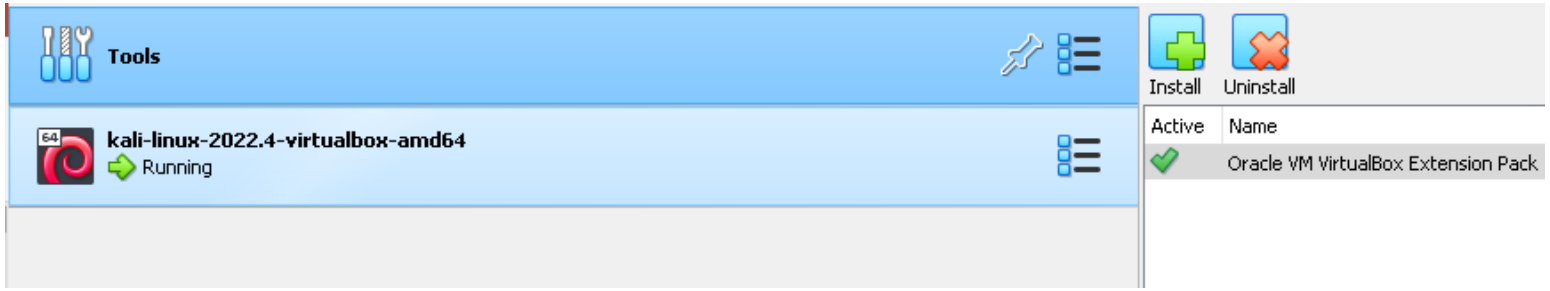
Install Kali Linux

- The most easiest and simple way is to use the VirtualBox to install Kali into the virtual machine. (I want it to co-exist with my Windows 10)
- Kali not only supports VirtualBox but also Vmware, both of the virtual machine
- I give this demo by using (downloading) the following:
  - VirtualBox 7.0.6 platform packages for Windows Hosts (VirtualBox-7.0.6-155176-Win.exe) ← main VirtualBox
  - Oracle_VM_VirtualBox_Extension_Pack-7.0.6a-155176 (enable the system tweaks in virtual machine)
  - kali-linux-2022.4-virtualbox-amd64.7z ← This is compressed a 7-Zip file, you can either decompress that by using WinRAR or 7-Zip
  - VC_redist.x64.exe ← Visual C++ 2019 redistributable (This is needed by the installation process of main VirtualBox)

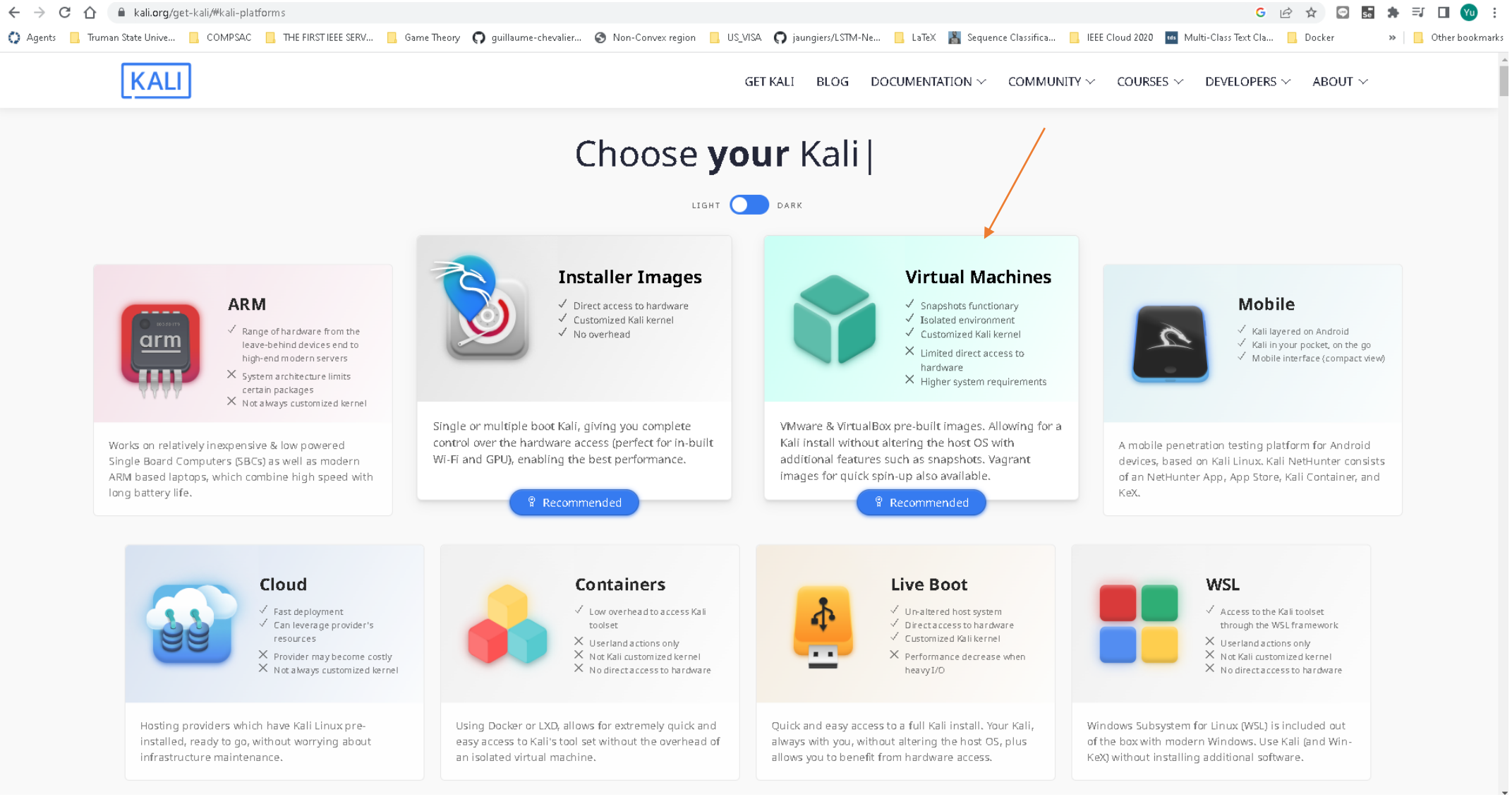
Install Kali Linux

- Before installing the VirtualBox, you need to install Visual C++ 2019 redistributable first
- When finishing, you will need to install the Extension pack in the VirtualBox

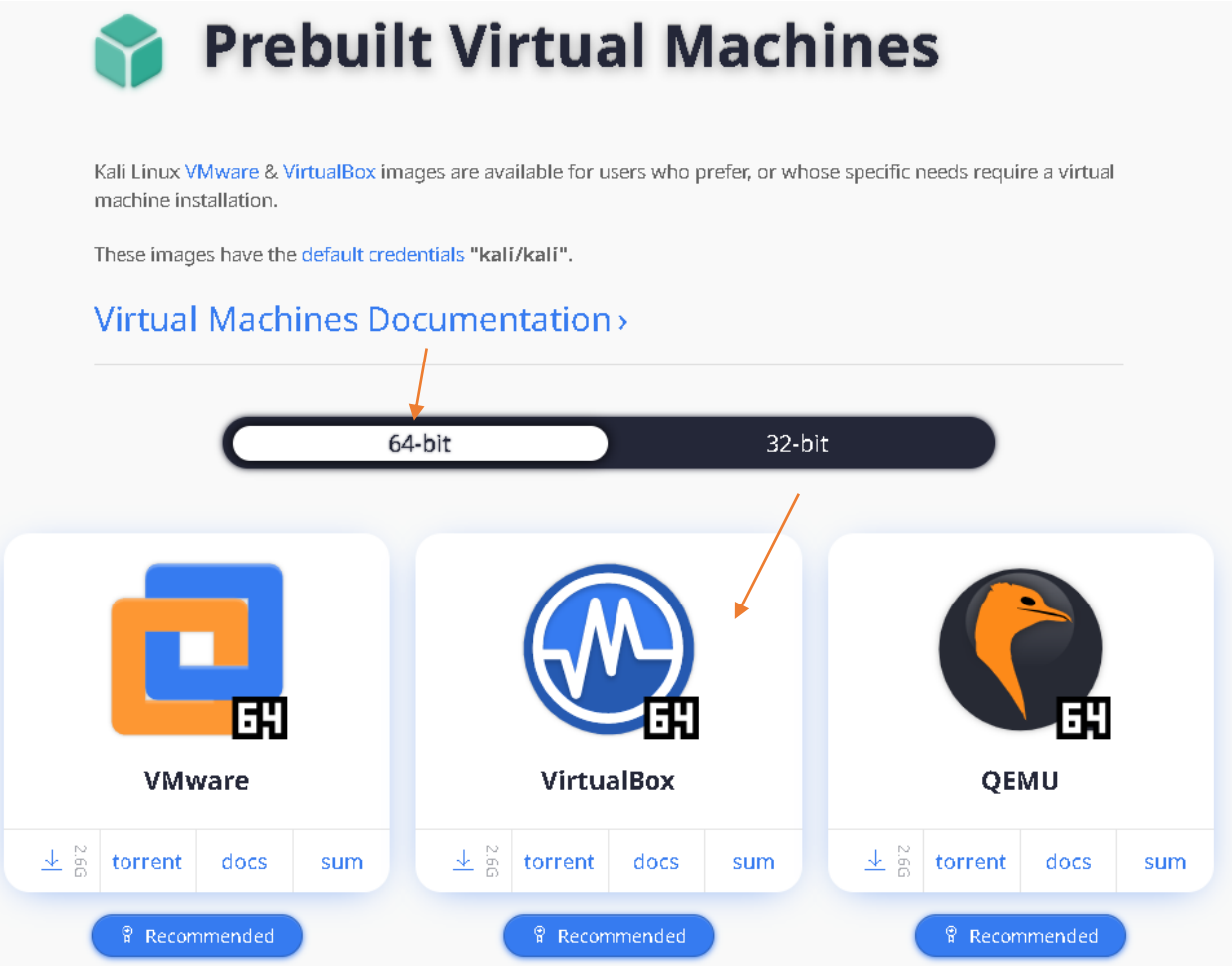




Install Kali Linux (choose the correct image)

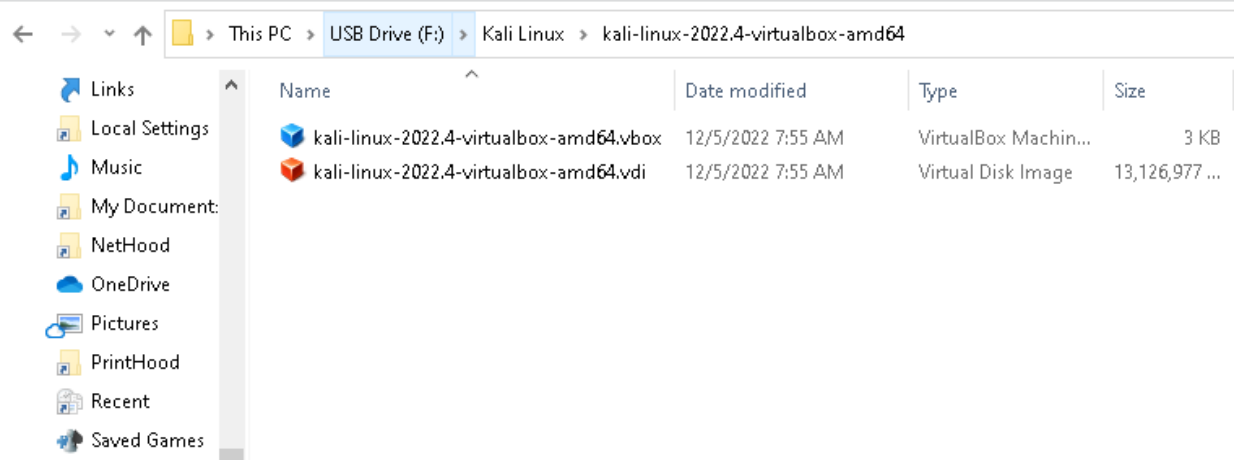


Install Kali Linux



When you finished the download and decompress the .7z file, you will find out these 2 files in the folder

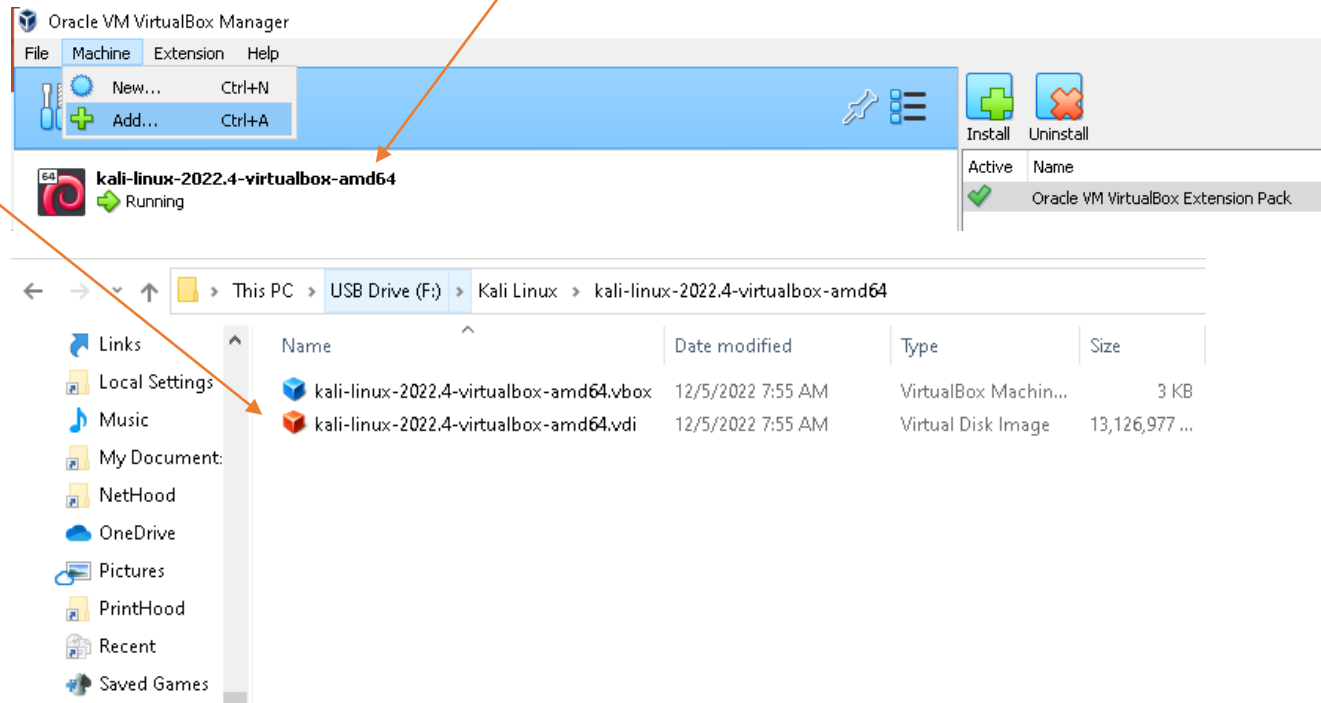
The .vdi file, you will need to open your VirtualBox to add the image as a new machine



Install Kali Linux

- Go back to VirtualBox by adding the .vdi file, the system image into VirtualBox. In my example, you will see the system image show up eventually.
- Machine → Add → Browse the local

folder and choose this image

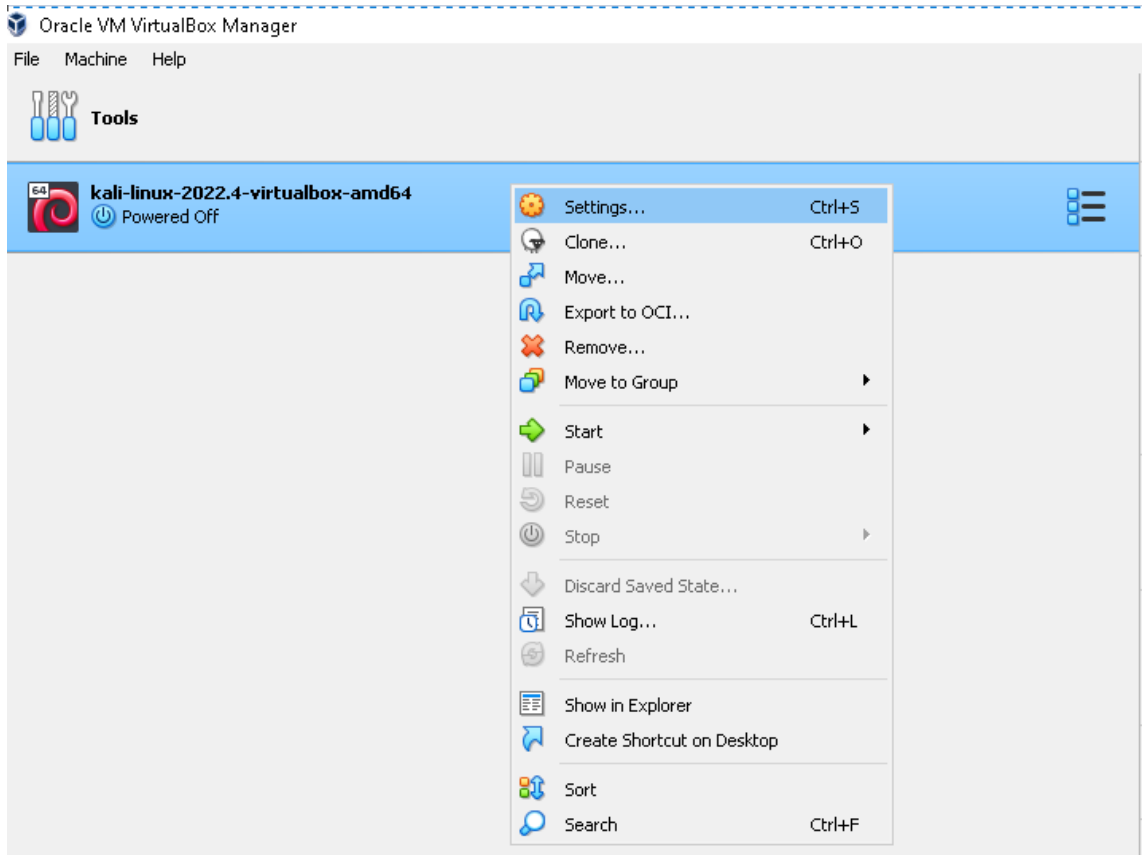


Install Kali Linux

- As you can see, I downloaded the image to the USB drive. However, I copied the image to the hard drive (SSD) then execute the previous step.
- I don’t like to directly execute the image from the USB even though it is possible. Because it is too slow!

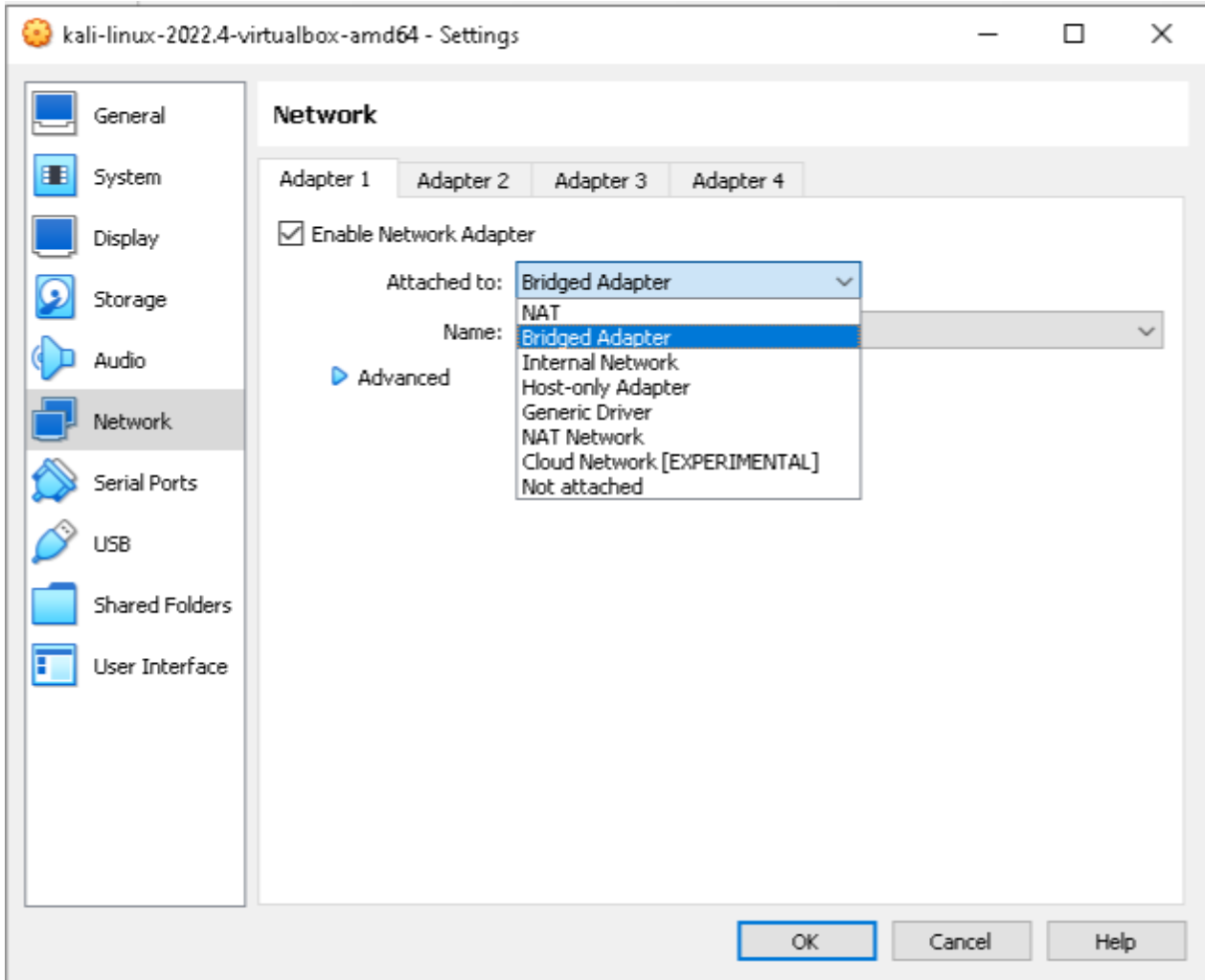
Install Kali Linux

- Go back to the VirtualBox, there are still some jobs we need to do the in the setup.
- Right click the virtual machine and click the “Settings”



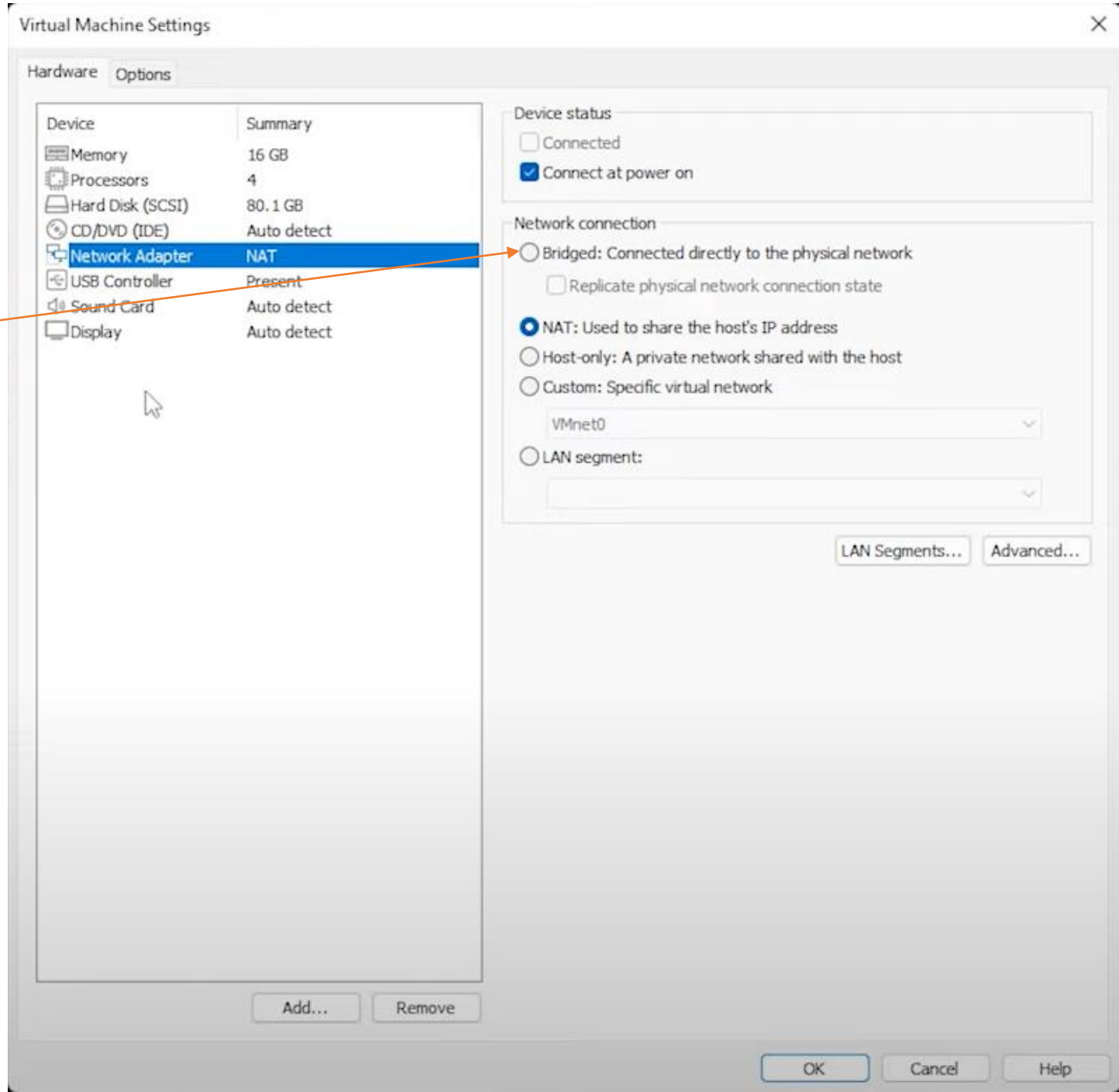
Install Kali Linux

- I choose the Bridged Adapter
- The reason why I choose this “Bridged Adapter”? I use another virtual machine software --- “VMWare” to explain this!
- Check the next page



Install Kali Linux

- “Bridged” means, the virtual machine will be treated as a totally independent machine like your host computer
- For example, if my Windows Host gets 192.168.0.42, the Bridged Kali Linux might get 192.168.0.31 in the intranet



Install Kali Linux

- Click the “Start” button and you will see the Kali launched
- The default login username / password is kali / kali as it is stated in the user’s manual
- After your logged in, you might need to do lots of setup, for example, the screen resolution and the most important, updating the packages as follows:
  - sudo apt update
  - sudo apt upgrade
- Considering you might allocate 2GB for its memory (by default), it would be very slow. Have a cup of coffee! Happy updating!

kali-linux-2022.4-virtualbox-amd64 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

1 2 3 4

22:58

File System

Home

Trash

Right Ctrl

Let’s do some Footprinting job.

- Let’s take our machine for examples.
- The 1st one is our sand server and the 2nd one is Dr. Alan’s server
- One thing we noticed that they both answered by a server located in 24.116.0.53
- If you bring this IP address and go to the

Google and ask a kind of service called “Reverse IP Lookup”, we can easily found our Truman uses the internet service from a company called cableone.net

```
┌──(kali㉿kali)-[~]
└─$ nslookup sand.truman.edu
Server:         24.116.0.53
Address:        24.116.0.53#53

Non-authoritative answer:
sand.truman.edu canonical name = vh222004.truman.edu.
Name:   vh222004.truman.edu
Address: 150.243.160.10
Name:   vh222004.truman.edu
Address: 150.243.160.11


┌──(kali㉿kali)-[~]
└─$ nslookup vh216602.truman.edu
Server:         24.116.0.53
Address:        24.116.0.53#53

Non-authoritative answer:
Name:   vh216602.truman.edu
Address: 150.243.160.100
```

Let’s do some Footprinting job.

- And? What amazes me is that, our “sand” server is not hiding behind the VPN or any additional protections? What!??

ptr:24.116.0.53 Find Problems

Type	IP Address	Domain Name
PTR	24.116.0.53 CABLE ONE, INC. (AS11492)	c1dns.cableone.net

- The sand server was assigned with 2 x IP addresses. It is very natural that it might have 2 x Gigabit Ethernet cards in its box
- The 2nd query is Dr. Alan’s server. Nothing special.

```
┌──(kali㉿kali)-[~]
└─$ nslookup sand.truman.edu
Server:         24.116.0.53
Address:        24.116.0.53#53

Non-authoritative answer:
sand.truman.edu canonical name = vh222004.truman.edu.
Name:   vh222004.truman.edu
Address: 150.243.160.10
Name:   vh222004.truman.edu
Address: 150.243.160.11


┌──(kali㉿kali)-[~]
└─$ nslookup vh216602.truman.edu
Server:         24.116.0.53
Address:        24.116.0.53#53

Non-authoritative answer:
Name:   vh216602.truman.edu
Address: 150.243.160.100
```

Let’s do some Footprinting job

- **Let’s take Dr. Alan’s machine as an example. (150.243.160.100)**
- **I use the nmap to scan his machine**
- **2 ports are found to be open.**
- **One is a http and the another is a ssh**
- **You can even see the version of Apache server he is using and what type of the SSH server (and also, its version)**
- **I will guess, he like to use the ssh to work from home and update his web pages / class schedules / course materials**

```
┌──(kali㉿kali)-[~]
└─$ nmap -v -A -sV 150.243.160.100
Starting Nmap 7.93 ( https://nmap.org ) at 2023-01-23 22:30 EST
NSE: Loaded 155 scripts for scanning.
NSE: Script Pre-scanning.
Initiating NSE at 22:30
Completed NSE at 22:30, 0.00s elapsed
Initiating NSE at 22:30
Completed NSE at 22:30, 0.00s elapsed
Initiating NSE at 22:30
Completed NSE at 22:30, 0.00s elapsed
Initiating Ping Scan at 22:30
Scanning 150.243.160.100 [2 ports]
Completed Ping Scan at 22:30, 0.06s elapsed (1 total hosts)
Initiating Parallel DNS resolution of 1 host. at 22:30
Completed Parallel DNS resolution of 1 host. at 22:30, 0.06s elapsed
Initiating Connect Scan at 22:30
Scanning vh216602.truman.edu (150.243.160.100) [1000 ports]
Discovered open port 80/tcp on 150.243.160.100
Discovered open port 22/tcp on 150.243.160.100
Completed Connect Scan at 22:30, 6.86s elapsed (1000 total ports)
Initiating Service scan at 22:30
Scanning 2 services on vh216602.truman.edu (150.243.160.100)
Completed Service scan at 22:31, 7.25s elapsed (2 services on 1 host)
NSE: Script scanning 150.243.160.100.
Initiating NSE at 22:31
Completed NSE at 22:31, 5.12s elapsed
Initiating NSE at 22:31
Completed NSE at 22:31, 0.25s elapsed
Initiating NSE at 22:31
Completed NSE at 22:31, 0.00s elapsed
Nmap scan report for vh216602.truman.edu (150.243.160.100)
Host is up (0.006s latency).
Not shown: 986 filtered tcp ports (no-response)
PORT     STATE  SERVICE     VERSION
20/tcp   closed ftp-data
21/tcp   closed ftp
22/tcp   open   ssh         OpenSSH 7.6p1 Ubuntu 4ubuntu0.5 (Ubuntu Linux; protocol 2.0)
| ssh-hostkey:
|   2048 0754d3011fb3e1947bbaa76c0d615830 (RSA)
|   256 20b29508ef3fd39396c4332440142a76 (ECDSA)
|_  256 4dd3d7c07bae205d8092c059ae3d65cc (ED25519)
53/tcp   closed domain
80/tcp   open   http        Apache httpd 2.4.29 ((Ubuntu))
|_http-server-header: Apache/2.4.29 (Ubuntu)
| http-methods:
|_  Supported Methods: HEAD GET POST OPTIONS
|_http-title: Apache2 Ubuntu Default Page: It works
```

Let’s do some Footprinting job

- For the rest of the ports are remaining close.
- He still gets good sense of computer security

--- all the unused ports are closed

- He is using Ububtu

```
110/tcp  closed pop3
113/tcp  closed ident
143/tcp  closed imap
443/tcp  closed https
554/tcp  closed rtsp
587/tcp  closed submission
993/tcp  closed imaps
995/tcp  closed pop3s
5222/tcp closed xmpp-client
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

NSE: Script Post-scanning.
Initiating NSE at 22:31
Completed NSE at 22:31, 0.00s elapsed
Initiating NSE at 22:31
Completed NSE at 22:31, 0.00s elapsed
```