Air Force Association's CyberPatriot

The National High School Cyber Defense Competition

Virtual Machines
Module 2

Objectives

- Define virtual machine
- Define common terminology
- Identify advantages and disadvantages
- Determine what software is needed; how to download and install that software
- How to run a virtual machine

Virtual Machine

- A virtual machine (VM) is an environment, usually a program or operating system, which does not physically exist but is created within another environment.
- Allows the ability to “run a computer within your computer”
- Can be viewed as a physical machine
  - Memory (RAM)
  - Ethernet connection
  - Storage (Hard disks)

Terminology

- Host operating system (host OS)
  - The operating system of the physical computer on which the virtual machine was installed.
- Guest operating system (guest OS)
  - The operating system running inside the virtual machine.
- Snapshot
  - A snapshot is a copy of the virtual machine's current state.
  - Multiple snapshots can be saved to go back to at any given time.
- Image
  - The actual virtual machine

Virtual Machine Advantages

- Advantages
  - Flexibility
    - Snapshots can be created to travel back and forward in virtual machine time
    - Run multiple operating systems (OS) and applications on one physical machine at the same time
    - Independent of hardware or software underneath the VM
    - Run legacy applications without having to changes current OS settings
  - Scalability
    - Multiple VMs can reside on one physical machine
  - Portability
    - Easily transported from one machine to another
  - Cost
    - Less expensive than buying multiple machines (less hardware to purchase)
    - Less power/electricity than having more physical machines
    - Save time testing new software without it affecting your current configurations

Virtual Machine Disadvantages

- Disadvantages
  - Requirements are a *must* when building
    - Purpose of the machine
    - How many users will need to be accommodated (now and in the future)
    - Types of demands users will be placing on the machine (now and in the future)
  - Performance might be degraded if necessary hardware has not been allocated
  - Running VMs simultaneously requires more hardware resources
  - Single point of failure
    - If host machine fails, all VMs residing on that machine fail

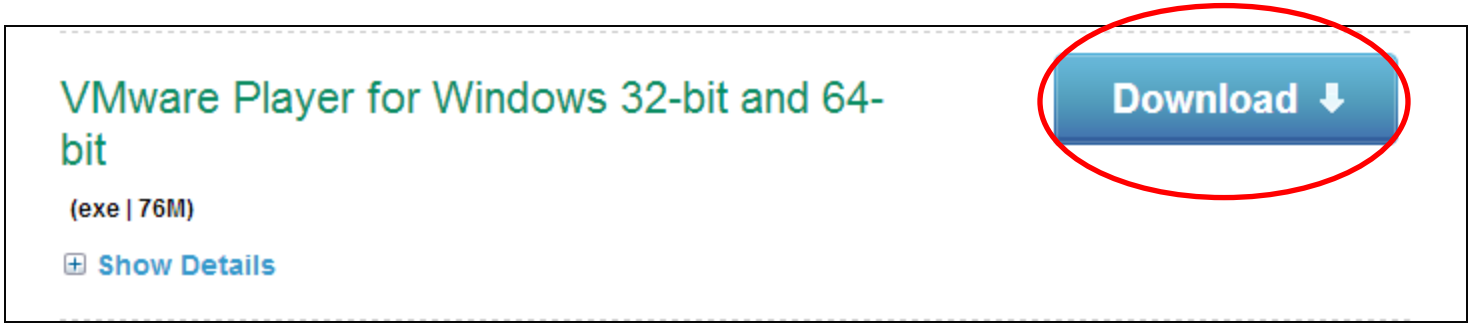
Tools

- Many tools exist to create and run virtual machines, however, CyberPatriot V will use VMware

- VMware player
  - A free product that will allow you to run virtual images on your computer
  - http://www.vmware.com/products/player/

VMware Player

- To obtain a copy of the VMware player software, follow these steps
  1. Open a web browser and type www.vmware.com/products/player/ into the location bar.
  2. Click on the “Download” button on the VMware Player home page.
  3. Scroll down and under ‘Product Downloads’ you will see various VMWare Player software for different operating systems. Find “VMware Player for 32-bit and 64-bit” and hit “Download



VMware Player

- Once the installer has finished downloading, double-click it to begin the installation.
- Follow the instruction prompts to install VMware Player and be sure to reboot your system when prompted at the end of the installation.

- **NOTE**: These instructions apply only to computers running a Windows operating system such as Vista, Windows 7, Windows XP, etc. If you are using a Linux-based system you will need a different version of the VMware software. If you are using a Macintosh you will need additional software, such as Fusion, as there is no VMware Player software available for Macintosh systems. These instructions also assume there are no VMware products already installed on the system you are using.

VMware Image

- When you create or download a VMware image you may notice there are several files associated with that image. DO NOT make any changes to these files unless specifically instructed to do so. Modifying these files can severely impact the performance of your virtual image and may render it inoperable.
- Some of the file types you will see associated with a VMware image are
  - *.vmdk:
    - Files ending in ".vmdk" are virtual disk files that VMware uses to simulate the hard drive for your virtual system. There may be one or more of these files associated with your virtual image as VMware allows you to split a single virtual disk into multiple 2GB files.
  - *.vmx:
    - Files ending in ".vmx" are VMware configuration files. These files contain details such as the type of hardware to simulate for the virtual system, the amount of memory to allow the virtual machine to use, and so on.
  - *.nvram:
    - This file stores the state of the virtual machine's BIOS.

Vmware Image

- C training and competitions require downloading of VMware images.
  - It is extremely important that you verify you have a “clean” download.
  - You may do this by matching the checksum of the file you downloaded with the checksum displayed on the web page where you downloaded the CyberPatriot image.
  - A checksum is a mathematical calculation based on the data contained in a file – matching checksums allows you to determine if a file has been corrupted or modified from its original state. If the checksum of the file you downloaded does not match the checksum displayed on the web page where you downloaded the file you must download the image again.

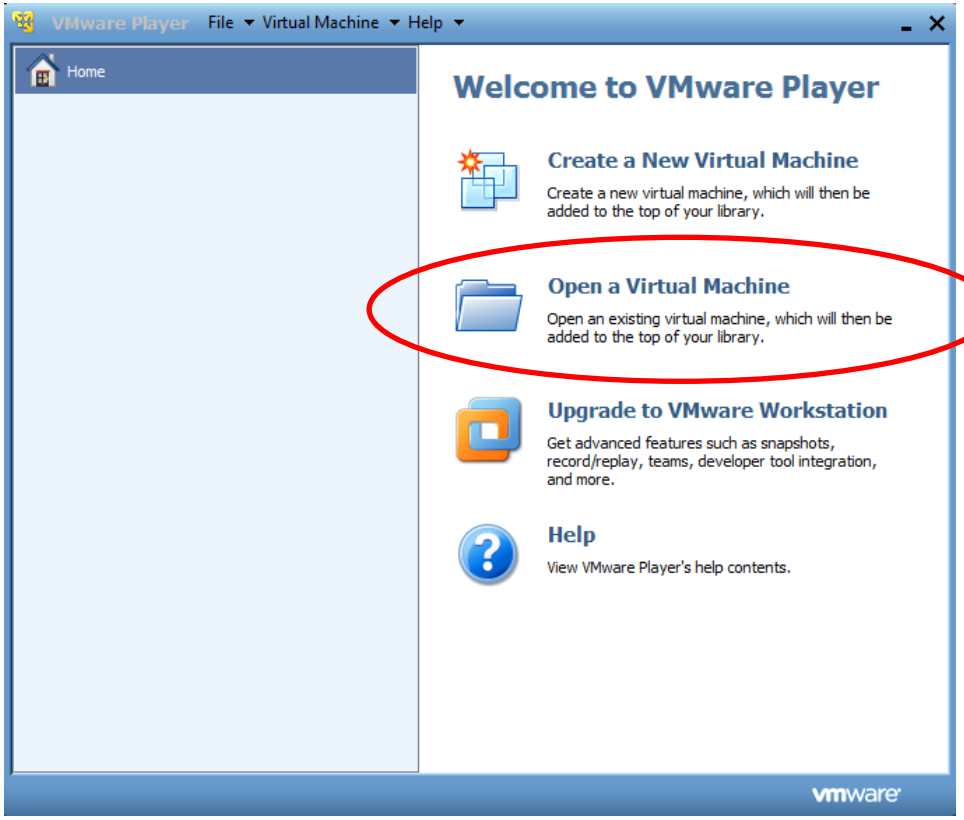
- VMware also hosts a Virtual Appliance Marketplace at http://www.vmware.com/appliances/.
  - Over 1,000 pre-built VMware images containing everything from different operating systems to demonstrations of security and network management products are available to download.
  - CyberPatriot is in no way affiliated with the Virtual Application Marketplace or any of the content made available through the marketplace. Users download and use the virtual appliances at their own risk.

VMware Image

- Download VMware images from the CyberPatriot website
  - Windows XP workstation
  - Windows 2003 server
  - Ubuntu workstation

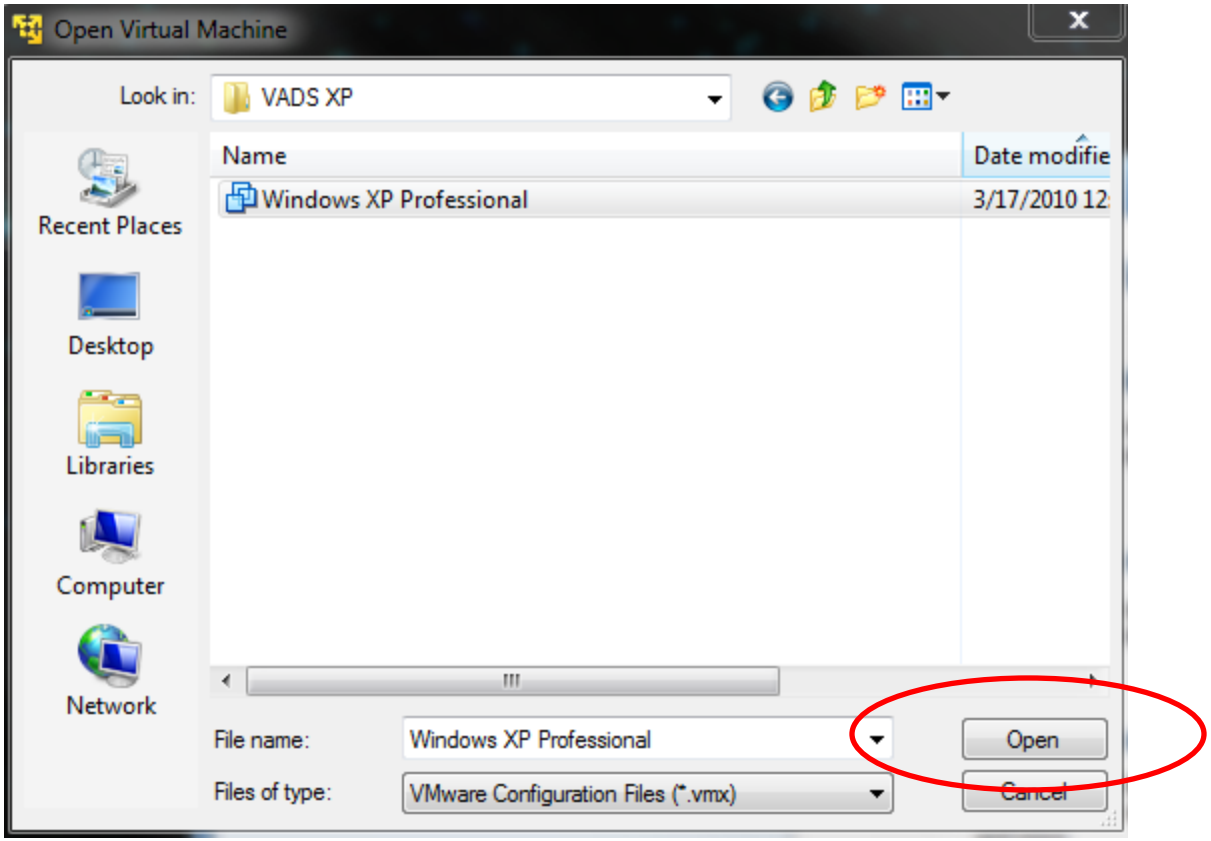
Open VMware Image

- To launch VMware Player and browse for a virtual image, follow these steps
  - Start the VMware Player software by selecting Start->VMware->VMware Player from your Windows Start menu
  - The below dialog box will appear. Click on “Open a Virtual Machine”.



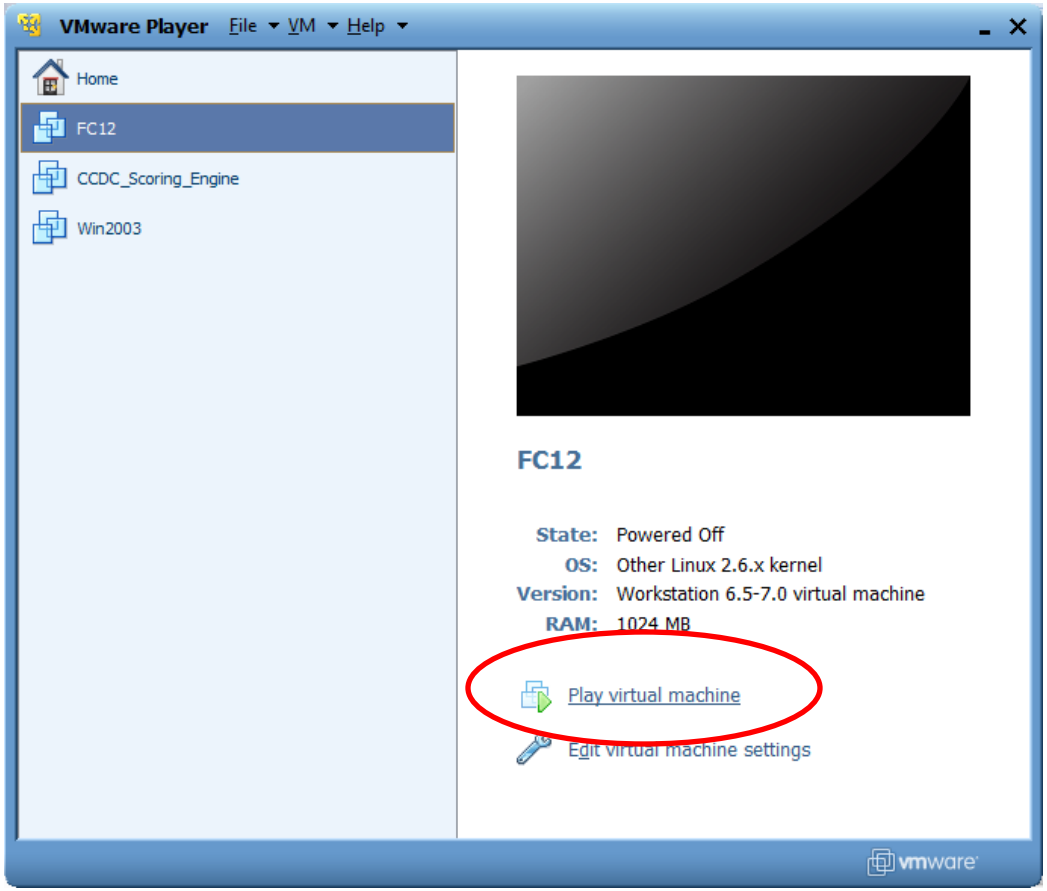
Open VMware

- Browse to the directory where you've downloaded or unzipped a virtual image. Click to select the .vmx file associated with the virtual image you wish to start and click the "Open" button



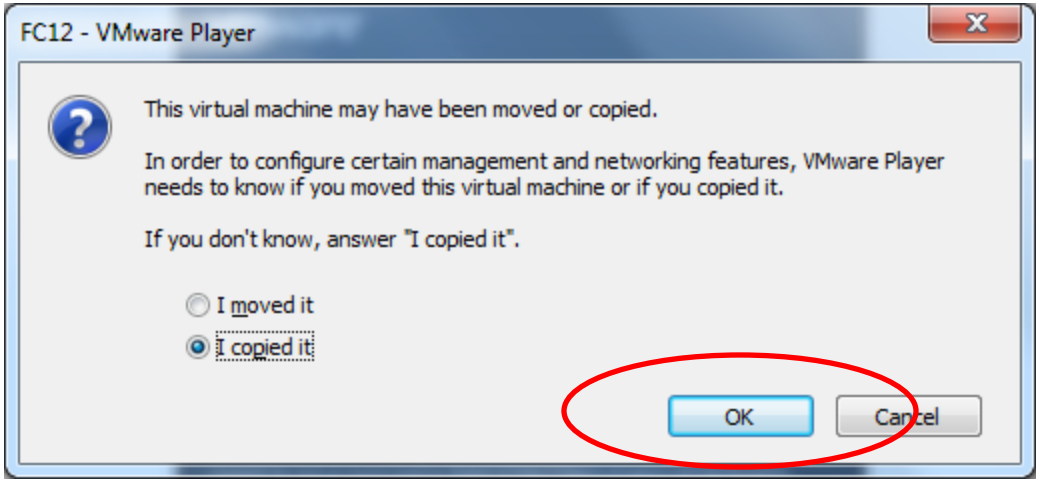
Open VMware Image

- This will take you back to the main VMware Player screen. Select the image name on the left, then click 'Play virtual machine'



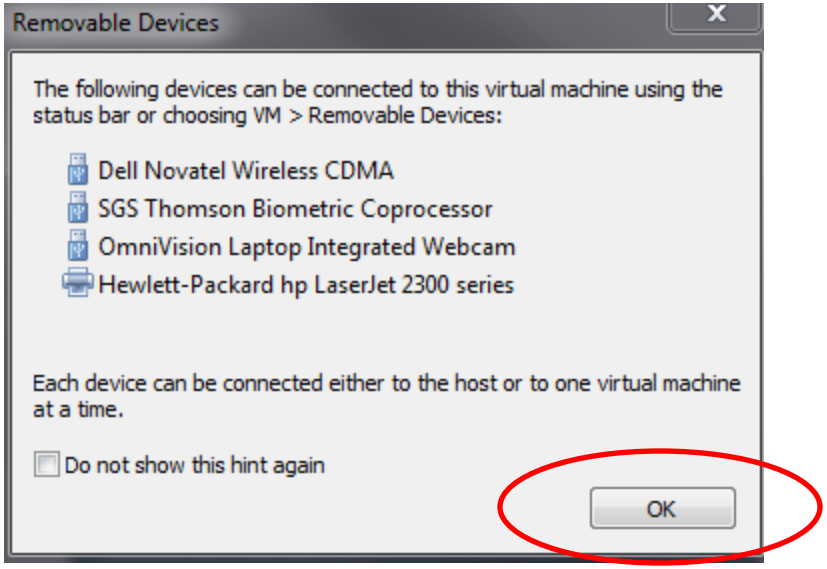
Open VMware Image

- If this is the first time you've started the VMware image a dialog box (see below) will appear
- Select 'I copied it', then Click 'OK' to continue



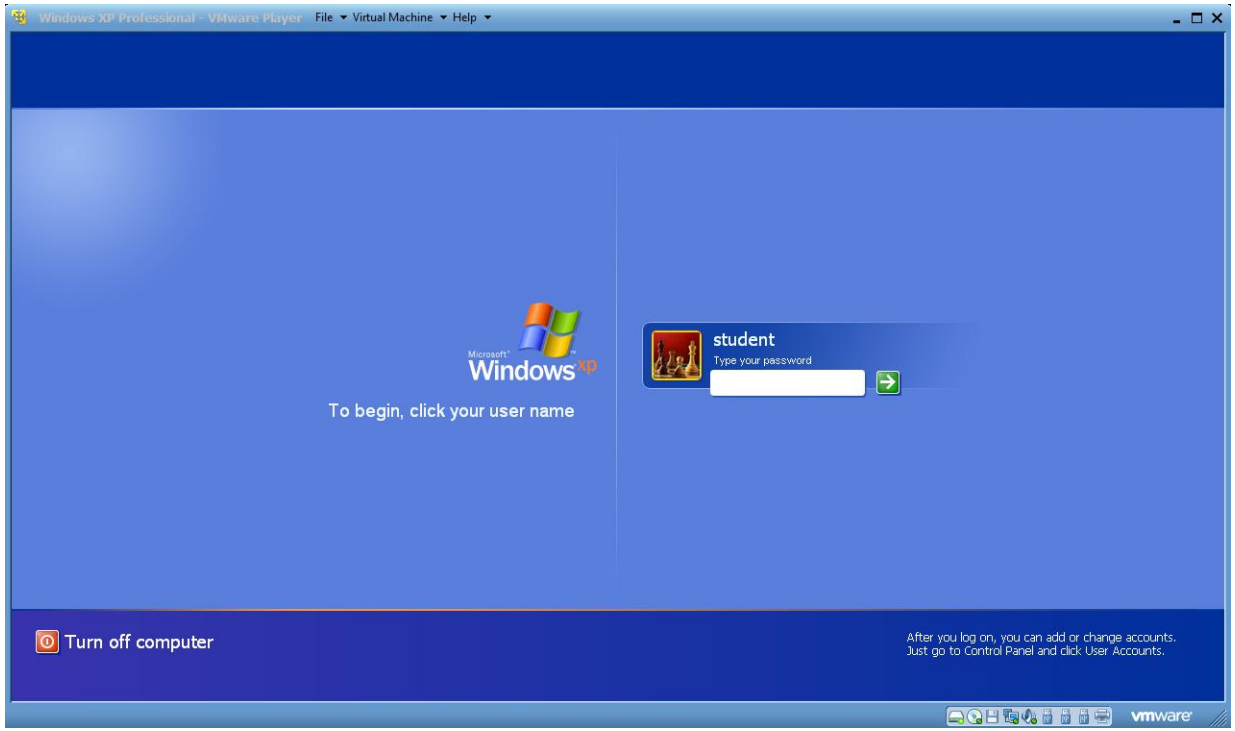
Open VMware Image

- The next screen you may see will a list removable devices that can be associated with and accessed by the virtual image.
- Click “OK” to continue.



Open VMware Image

- When the virtual image has finished booting, you will see a login screen or welcome screen just as you would on a physical computer loaded with the same operating system that is running inside your virtual image. For example, a virtual image running Windows XP.



Summary

- Defined virtual machine
- Defined common terminology
- Identified advantages and disadvantages
- Determined what software is needed, how to download and install that software
- Demonstrated how to run a virtual machine

References

- http://www.webopedia.com/TERM/V/virtual_machine.html
- http://www.vmware.com/products/player/
- http://www.vmware.com/appliances/