UNIT THREE

Computer Basics and Virtual Machines
SECTION ONE

How Computers Work
• The central processing unit (CPU) does the grunt work of the computer.

• Random access memory (RAM) saves your progress in many different software programs so you can access that temporarily saved data later on. RAM is temporary. It is wiped when you turn off the computer.

• Storage allows use to save data more permanently. Read-only memory (ROM) is read-only and does not change often.
Software: The BIOS

**Basic Input-Output System**

- Allows the **operating system** (OS) to connect with input, output, and storage devices
- Embedded on the motherboard by the manufacturers, and is a permanent piece of the computer
- Connects the CPU with the OS so the computer can boot up
- Manages basic system settings like date and time and power management

Software: Operating System

- **Examples:** Microsoft Windows, Linux, Mac OS X
- Coordinates a system’s resources so things perform and respond predictably for the user
- Allows users to configure the computer’s resources without making permanent changes to them
- Uses graphical user interface make it easier for non-technical users to use navigate the system
- Manages the hardware/software resources so they are used efficiently by applications

Source: [distrowatch.com](http://distrowatch.com)
Source: [getintopc.com](http://getintopc.com)
Source: [theguardian.com](http://theguardian.com)
Software: Applications

• Perform tasks to benefit the user
• Apply computer resources to a specific purpose designated by the user
• Often designed for a particular type of organization
• Sometimes bundled with the OS


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Networking Basics

- **Servers**: Computers dedicated to managing shared resources
- **Switch**: Controls traffic within a network
- **Router**: Controls traffic between networks
- **Firewall**: Screens incoming and outgoing traffic for anomalies and potential threats

SECTION TWO

Virtual Machines
What is a VM?

- A virtual machine (VM) is an environment, such as a program or operating system that does not physically exist, but is created within another environment.
- Does not have hardware, a power supply, or other resources that would allow it to run on its own.
- Essentially allows you to run a computer within your computer.
VM Terminology

• **Host [operating system]**: The OS on the physical computer on which the VM is installed

• **Guest [operating system]**: The OS the VM runs

• The Host OS and Guest OS do not need to be the same

• **Image**: Another term for VM
VM Advantages

- **Flexibility**
  - Run multiple OSes on one physical machine

- **Scalability**
  - Run multiple VMs on the same computer

- **Portability**
  - Easily transfer VMs to different computers

- **Cost**
  - Save time testing new programs or configurations on a VM rather than disrupting the host
  - Run multiple systems on the same computer (save hardware costs and floorspace)
VM Disadvantages

- Performance depends on host machine’s hardware
- Single point of failure
  - If the host fails, progress on VM is lost
- Running VMs pulls hardware resources from host machines
• A software program used to create and run VMs
• Used to run CyberPatriot competition images
• VMware images contain several files that should not be modified:
  - *.vmdk: virtual disk files
    • Simulate the hard drive for your virtual system
  - *.vmx: configuration files
    • Contain details such as the type of hardware to simulate for the virtual system and the amount of memory to allow the VM to use
  - *.nvram: VM’s BIOS files
Checksums

- A mathematical calculation based on the data contained in a file
- Comparing the checksum of a program you downloaded to the checksum it is supposed to have will allow you to determine if the file has been corrupted or modified
- Before each round, CyberPatriot teams must verify the checksums of the competition images to make sure the images downloaded correctly
1. Open VMware Player
2. Click “Open a Virtual Machine”
3. Browse for and open the .vmx file in the image folder you downloaded
4. Click “Play virtual machine”
5. Select “I copied it”
6. Click “OK” on Removable Devices pop-up
7. Log into the user account specified in the StartEx email if not automatically logged in