



AIR FORCE ASSOCIATION'S

CYBERPATRIOT

NATIONAL YOUTH CYBER EDUCATION PROGRAM

UNIT THREE

Computer Basics and Virtual Machines



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SECTION ONE

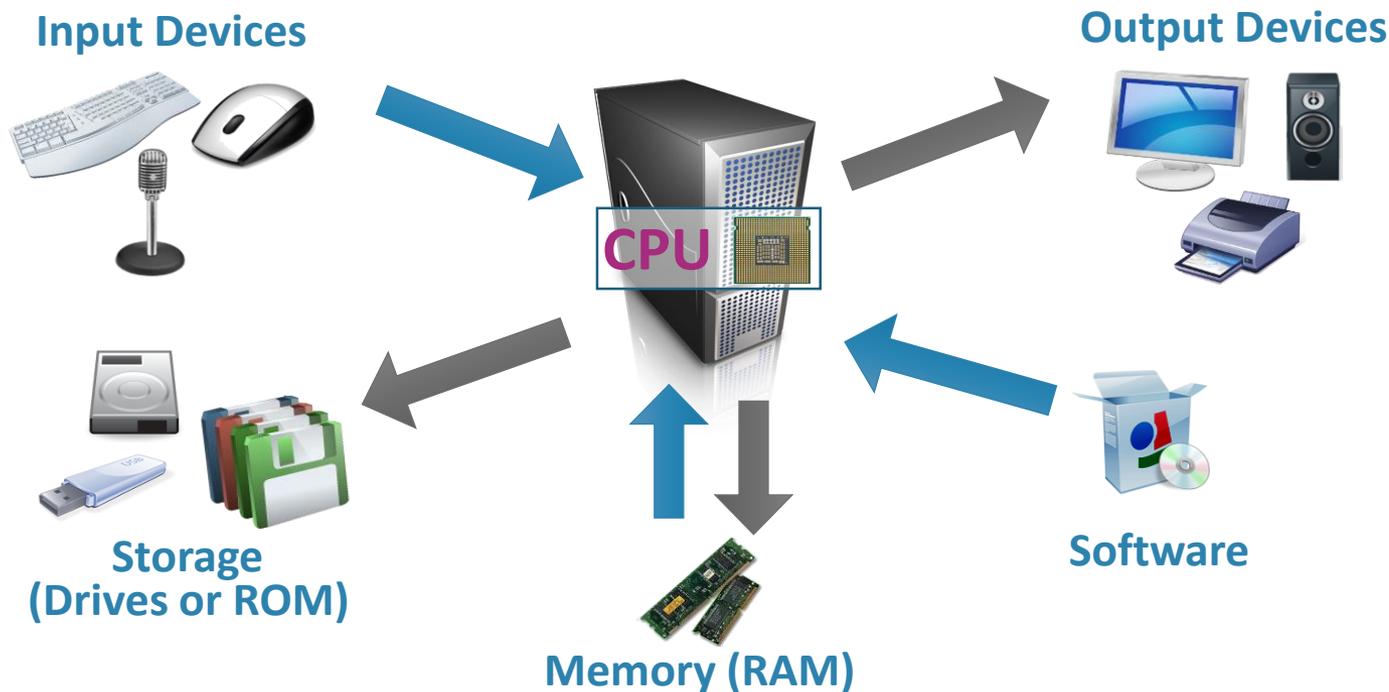
How Computers Work



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Computer Anatomy 101



- 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



Source: itprostuff.com

- 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

Source: www.Computer.HowStuffWorks.com



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: getintopc.com



Source: distrowatch.com

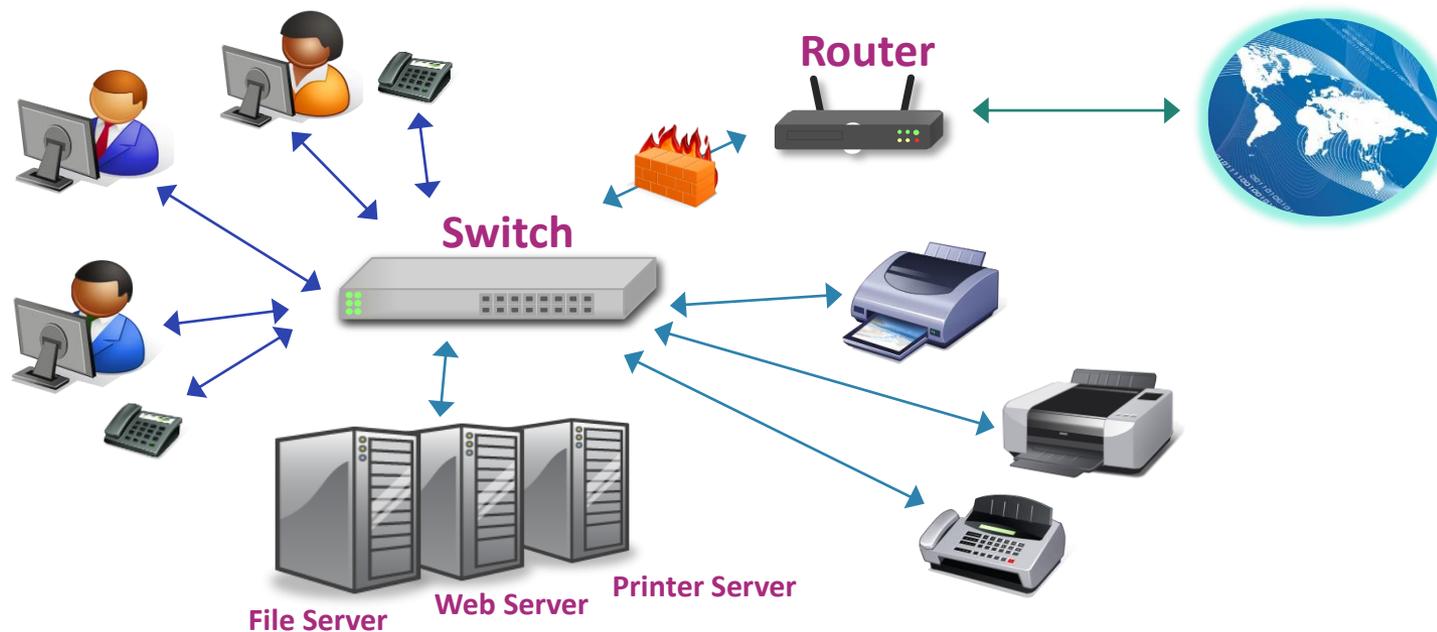


Source: theguardian.com

Source: www.Computer.HowStuffWorks.com



Networking Basics



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

Source: https://www.cisco.com/cisco/web/solutions/small_business/resource_center/articles/connect_employees_and_offices/networking_basics/index.html



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SECTION TWO

Virtual Machines



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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





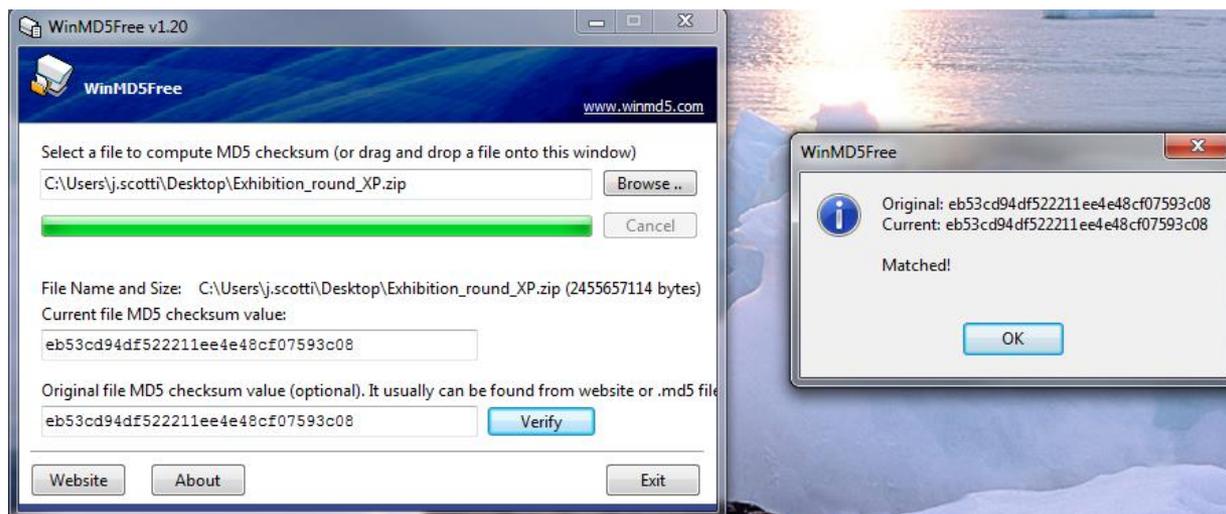
VMware

- 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





Opening an Image

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

