Virtualisation Worksheet - Learner Version

Video: https://www.youtube.com/watch?v=UBVVq-xz5i0

Instructions: - Watch the video fully once. - Re-watch to answer questions and complete tasks. - Reflect on your answers and research any unclear points.

Part 1: Key Concepts

1. **Define virtualisation:** Virtualisation is when one physical computer is divided into several "virtual" computers. Each virtual computer (called a **virtual machine**) acts like it's a real, separate computer, even though they're all running on the same hardware.

2. **List the main components of a virtualised environment (hypervisor, host, guest):**
   - **Host:** The physical computer that provides the hardware.
   - **Hypervisor:** The software that creates and manages virtual machines.
   - **Guest:** Virtual machines that run their own operating systems and applications.

3. **What analogy does the video use for virtual machines?**
   The video compares virtual machines to having **many smaller computers running inside one big computer**. Instead of using three separate physical servers (for email, web, and database), you can run three virtual machines on one powerful server.

4. **Name at least two benefits of virtualisation:**
   - Saves money because you don't need as many physical servers.
   - Uses hardware more efficiently no wasted power or space.
   - Easier to move, back up, or restore systems because VMs are just files.
   - Allows testing different operating systems on the same computer.

5. **Mention any risks or considerations of virtualisation discussed in the video:**
   - If the physical host fails, all virtual machines on it stop working too.
   - Performance can be slightly lower because resources are shared.
   - Software licensing can sometimes be tricky in virtual environments.

Part 2: Process & How It Works

6. **Write the sequence of steps to create/run a VM:**

   Step 1: Set up a physical computer or server (the host) with enough CPU, memory, and storage.

   Step 2: Install a **hypervisor,** software that manages virtual machines.

Step 3: Use the hypervisor to **create a virtual machine** and assign it hardware resources (like CPU cores, RAM, and storage space).

Step 4: Install an operating system (guest OS) inside the virtual machine, then install and run the apps you need.

7. **What is the role of the hypervisor?**
The **hypervisor** is the program that creates and manages virtual machines. It divides the host's hardware so each VM gets its own share of resources, and it keeps all the virtual machines isolated from one another.

8. **How does the guest OS differ from the host OS?**

The **host OS** runs directly on the physical computer and manages the hardware.

The **guest OS** runs inside a virtual machine it thinks it's running on its own computer, but it's actually using virtual hardware provided by the hypervisor.

Part 3: Real-World Applications

9. **Give an example of organisational use of virtualisation:**

A company might use virtualisation to run several servers such as email, file storage, and databases on one physical machine instead of buying separate servers for each task. This saves money and space.

10. **Give an example of virtualisation in a cyber-security context:**

Security teams use **virtual machines for testing malware** or suspicious files in a safe, isolated environment. If something harmful happens, it only affects the virtual machine, not the real computer.

Part 4: Reflection & Extension

11. **Which part of virtualisation do you understand well?**

I understand how virtual machines let you run multiple operating systems on one computer using a hypervisor.

12. **Which part do you need to explore further?**

I want to learn more about how networking works between virtual machines and how they connect to the internet or each other.

13. **Explain virtualisation to a non-IT person using the video analogy:**

It's like having big house (your computer) divided into smaller apartments (virtual machines). Each apartment has its own kitchen, bathroom, and furniture (operating system and apps), even though they all share the same building (hardware).

14. **Research one term from the video you were unsure about:**

Term: Hypervisor

Definition: Software that allows multiple virtual machines to run on one physical computer by sharing its resources.

Example: VMware, Microsoft Hyper-V, or Oracle VirtualBox are common hypervisors used to create and manage VMs.

Additional Challenge Questions

1. **Explain the difference between Type 1 and Type 2 hypervisors. Give examples.**
   Type 1 (Bare Metal) - Runs directly on the physical hardware, with no operating system underneath. Used mainly in servers.
   Examples: VMware ESXi, Microsoft Hyper-V (Server), KVM.

   Type 2 (Hosted) - Runs on top of an existing operating system (like Windows or macOS). Common for personal use or testing.
   Examples: VirtualBox, VMware Workstation, Parallels Desktop

2. **If a host has 16 GB RAM and 4 VMs each need 4 GB, what happens if you add another VM?**
   - 4 VMs × 4 GB = 16 GB total — all RAM is used up.
   - Adding another VM means there's not enough memory to go around.
   - The host or VMs may slow down, freeze, or swap memory to disk (which hurts performance).
   - Some hypervisors use memory overcommitment, but it can still cause performance issues.

3. **How does virtualisation help contain a ransomware attack?**
   - Each VM is isolated from others.
   - If ransomware infects one VM, it usually can't spread to other VMs or the host machine.
   - You can easily restore a clean backup or revert to a snapshot of the - - VM before the infection.
   - Virtualisation limits damage and makes recovery much easier.

4. **How is virtualisation used in cloud computing?**
   - Cloud providers (like AWS, Azure, and Google Cloud) use virtualisation to divide large physical servers into many virtual machines for customers.
   - Each customer gets their own isolated environment that feels like a full computer.
   - It allows scalability, cost savings, and flexibility you can create or delete VMs on demand without buying new hardware.
   - Virtualisation is the foundation of cloud computing, it's what makes "the cloud" possible.

End of Worksheet