**Key Terms**

**CIFS**

The Common Internet File System is a file system protocol that allows a user on a client computer to access files and printers on a network.  
[Section 4.3.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.4)

**DevOps**

The process of combining development and IT operations to simplify development for an application, thus making the time to assemble, evaluate, and release the application minimal for organizations today.  
[Section 7.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.1)

**DevSecOps**

The process of combining DevOps and cybersecurity to apply security measures throughout the application (software) building process  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

**ESXi**

A VMware hypervisor.  
[Section 5.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.1)

**FC**

Fiber Channel is a storage protocol used to transmit data on the TCP/IP network.  
[Section 4.3.5](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.5)

**FCoE**

Fiber Channel over Ethernet is a storage protocol used to transmit data on the TCP/IP network.  
[Section 4.3.5](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.5)

**HBA**

A Host Bus Adapter is a piece of hardware that is plugged into a server and adapts the server to the storage device’s protocol.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**HDD**

A Hard Disk Drive is a storage device that uses magnetic rotating disks to hold data. The data is then read by a rotating arm that reads and writes the data onto the disk.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**Infrastructure as a Service (IaaS)**

Access to a dedicated virtual or physical system that you manage and maintain yourself.  
[Section 6.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/6.1)

**LAN**

A Local Area Network: a network that is usually used in just one location (such as an office, home, or school), and is normally connected using ethernet cables.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**NFS**

The Network File System is a file system protocol that allows a user on a client computer to access files stored elsewhere on a network.  
[Section 4.3.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.4)

**NIC**

A Network Interface Controller is a piece of networking hardware that is part of, or attaches to, the motherboard and connects a computer to a network.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**ODD**

An Optical Disk Drive is a storage device that uses lasers to read and write data onto optical disks.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**Platform as a Service (PaaS)**

The ability to upload their to pre-configured web servers, database servers, and application servers without having to install or maintain any of the servers’ applications or operating systems.  
[Section 6.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/6.1)

**RAID**

A Redundant Array of Independent Disks is two or more storage drives that are linked together to create one single large volume of storage.  
[Section 4.3.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.1)

**SAS**

Serial Attached SCSI is a transmission protocol in which data is transferred between devices, one bit at a time, at high speeds.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**SATA**

A Serial Advanced Technology Attachment is a computer interface that connects the motherboard to mass storage devices.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**SCSI**

The Small Computer System Interface is a set of standard interfaces that allow computers to communicate with peripheral hardware.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**SSD**

A Solid State Drive is a collection of electronic circuits that store and transmit data. SSDs are faster, more durable, and have higher efficiency, because they do not have any moving parts, therefore, they require less energy to operate.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**Software as a Service (SaaS)**

Direct, on-demand access to shared applications and data over the internet, without the need to install or configure software.  
[Section 6.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/6.1)

**TCP/IP**

The Transmission Control Protocol/Internet Protocol is a program that computers use to send messages to each other. The TCP layer of the program breaks the content of the message a computer sends into smaller bits of information, while the IP layer of the message is the address of the computer the message is being sent to.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**ThinApp**

VMware technology that delivers virtualized applications that are compatible with any machine.  
[Section 5.5](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.5)

**USB**

A Universal Serial Bus is a standard interface that allows peripheral devices to communicate with a host (such as a computer, smart phone or games console).  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**VLAN**

A Virtual Local Area Network allows a single physical LAN (local area network) to be further segmented so that groups of ports are isolated from one another as if they were on physically different network segments.  
[Section 5.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.4)

**VMFS**

A Virtual Machine File System is a high-performance file system that is optimized for storing virtual machines.  
[Section 5.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.3)

**app modernization**

The process of updating application software to make it compatible with modern programming languages and infrastructures (i.e. the cloud).  
[Section 7.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.3)

**application software**

Application software runs on top of the operating system, and needs to be installed after the OS. The application software tells your system to carry out tasks.  
[Section 2.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.1)

**best-of-breed infrastructure**

Data center infrastructure that uses different top-of-the-line components (such as best-of-breed servers, storage devices and networking equipment) from multiple vendors.  
[Section 4.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.4)

**blade**

A thin, large rectangular compute system (a server) that slides horizontally onto the racks of a frame in a data center.  
[Section 4.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.1)

**block-level storage**

Data is saved in huge fixed-sized volumes called "blocks"; each block is treated like an individual hard disk drive, has a unique identifier and has its own file system.  
[Section 4.3.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.2)

**cloud controller-manager**

Embeds cloud-specific Kubernetes operation controls.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**cloud native deployment**

The process of using microservices in the cloud to build applications.  
[Section 7.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.3)

**cluster**

The grouping together of a number of similarly-configured servers that have connections to the same network and storage to provide an aggregate set of resources in the virtual environment.  
[Section 4.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.1)

**cold conversion**

The practice of shutting down the applications on a hardware server before converting that server to a virtual server.  
[Section 5.6](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.6)

**consolidation**

Moving applications that are running in the old hardware-based data center model to the virtual data center model.  
[Section 5.6](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.6)

**containment**

The practice of not deploying any existing applications on virtual servers.  
[Section 5.6](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.6)

**controller manager**

Combines several Kubernetes processes (including the node controller which deploys new nodes and responds when nodes become unavailable; and the replication controller which provides pod templates for the automated production of replica pods) into a single process.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**converged infrastructure**

Data center infrastructure that integrates all the hardware and software components into a single package from a single vendor.  
[Section 4.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.4)

**endpoint**

Devices that are connected to a network, such as a laptop, desktop, mobile phone, virtual machine, or container to give a few examples.  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

**endpoint security**

The practice of using security systems to secure endpoints such as desktops and mobile devices in the cloud or on a network.  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

**etcd**

Stores Kubernetes cluster data.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**ethernet cable**

A type of networking cable that physically connects devices such as servers, routers, and switches on a network using the Ethernet protocol.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**file-level storage**

Data is saved in files and folders in a hierarchical system of directories and sub-directories; in order to be accessed, the storage drives need to be configured with the appropriate file system: the Network File System for a Unix or Linux system, or the Server Message Block file system for a Microsoft Windows system.  
[Section 4.3.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.2)

**hot conversion**

The practice of not shutting down the applications on a hardware server before converting that server to a virtual server.  
[Section 5.6](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.6)

**hyper-converged**

Data center infrastructure that integrates virtualized data center components from one vendor.  
[Section 8.9](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/8.9)

**hypervisor**

Software that is installed on top of hardware, creating the virtualization layer and acting as a platform for the virtual machines to be created on. The hypervisor acts as host to the virtual machines.  
[Section 2.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.2)

**iSCSI**

The Internet Small Computer Systems Interface is a storage protocol used to transmit data on the TCP/IP network.  
[Section 4.3.5](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.5)

**isolation**

When a processes or systems on an operating system are separated from each other.  
[Section 2.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.3)

**kube-apiserver**

Manages communication between etcd, kube-scheduler, the controller manager and the cloud controller-manager. It also monitors the state of the cluster and makes changes as necessary.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**kube-proxy**

A network proxy (i.e. a gateway between internal and external networks). It also enables communication between pods on different nodes, and load balances if traffic to a container is high.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**kube-scheduler**

Selects the best node to place each Kubernetes pod on.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**kubelet**

Receives instructions from kube-apiserver and ensures that the containers in a pod are running as they should be; it will destroy and restart containers as required.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**management server**

A computer that is set up to monitor the data center’s performance and allow the administrators to allocate resources efficiently.  
[Section 4.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.4)

**master node**

In Kubernetes, a master node monitors and manages worker nodes.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**micro-segmentation**

Networking protocols that provide security for virtual machines and containers individually on a network.  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

**node**

A node is a physical or virtual machine.  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**operating system**

The operating system (OS) controls the hardware and is directly connected to it. The OS runs in the background and pulls up a user interface to access files and install programs. Some examples of commonly used operating systems are Windows, Mac OS X, and Linux.  
[Section 2.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.1)

**partitioning**

Splitting hardware into multiple ‘parts’, to allow for multiple OS on one machine, with the underlying hardware resources shared.  
[Section 2.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.3)

**pod**

In Kubernetes, a pod is a logical (i.e. software) unit that contains one or containerized apps and the shared resources needed to run them. Each pod has its own routable IP address (that is, an IP address that can be accessed by external networks).  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**port**

The interface that serves as the point of communication between a network and a device that is on that network.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**protocol**

A "language" that different parts of a computer system can use to understand each other and work together.  
[Section 4.3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.3)

**rack-mounted**

A thin, large rectangular compute system (a server) that slides horizontally onto the racks of a frame in a data center.  
[Section 4.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.1)

**router**

A device that is part of a network that can send/receive data from its network to another.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**switch**

A piece of networking hardware that connects devices to each other within a network.  
[Section 4.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.2)

**system software**

A type of software that is necessary for the hardware to function, such as the BIOS.  
[Section 2.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.1)

**thick provisioning**

Traditional provisioning where the logical space provided by partitioning is equal to the amount of actual physical space set aside on the disk.  
[Section 4.3.7](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.3.7)

**thin client**

A small computer device that functions by relying on the server for processing rather than using its own hardware.  
[Section 3.3](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/3.3)

**tower**

A traditional PC, used either as a personal desktop PC at home or as a server in a data center.  
[Section 4.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/4.1)

**vCenter**

VMware software that centralizes the management of all virtual machines, hosts and dependent components in a VMware vSphere virtual data center.  
[Section 5.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.1)

**vSphere Host Client**

A VMware program that configures only hosts and operates its virtual machines.  
[Section 5.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.1)

**vSphere Web Client**

A VMware program that configures vCenter and the host, and operates its virtual machines.  
[Section 5.1](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/5.1)

**virtual machine**

A software computer that runs on a host and operates like a physical computer with an operating system and applications.  
[Section 2.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/2.2)

**worker node**

A Kubernetes worker node will contain up to 100 pods, along with kubelet (see separate Key Terms entry) and kube-proxy (see separate Key Terms entry).  
[Section 7.2](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.2)

**workload security**

The process of tracking and monitoring workloads for vulnerabilities. This involves applying security measures not just at endpoints, but rather at the workload level on the endpoints.  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

**zero-trust**

A security architecture that provides multi-layer security protocols for an organizations network. The zero-trust architecture is made upd of five pillars of trust which is used to grant access. The five pillars are device trust, user trust, transport/session trust, application trust, and data trust.  
[Section 7.4](https://content.netdevgroup.com/contents/cloud-virt-concepts/z46DjzEe2c/7.4)

 The virtualization layer allows you to install an operating system of your choice to the virtual machine. This is called the guest operating system.

Aside from being a solution for hardware inefficiency, what are the most obvious benefits of a virtual machine to a user? The following highlights the benefits of a virtual machine compared to a traditional hardware computer.

Physical Machine:

* Difficult to move or copy
* Bound to a specific set of hardware components
* Often have a short life cycle
* Require personal contact to upgrade hardware

Virtual Machine:

* Easy to move and copy because they are encapsulated into files and independent of physical hardware
* Easy to manage because they are isolated from other virtual machines running on the same physical hardware
* Insulated from physical hardware changes

You now know that virtualization hosts (hypervisors) give hardware the ability to virtualize and therefore create multiple virtual machines that each run on the operating system of your choice. This ability to choose to run multiple operating systems is called **partitioning**. The definition of partitioning is the ability to run multiple operating systems on a single physical system and share the underlying hardware resources. **Section.2.3.**

Another development in the efficiency of technology due to virtualization is the ability to isolate VMs, called **isolation**. When you are using a traditional computer, the system operates in an open environment, meaning that its hardware is vulnerable. This means that every time a computer has issues, the user, or computer administrator, has to diagnose the machine and fix it. Isolation also means that virtual machines are highly portable, and can be moved or copied to any industry-standard hardware platform, regardless of the make or model. Thus, virtualization makes IT resource management more adaptive, and provides greater responsiveness to changing business conditions.

**Section2.3**

Because the Type 1 hypervisor is installed directly on the hardware, it is referred to as a **bare metal hypervisor**. The hypervisor software is literally installed onto the metal hardware. **Section3.1.**

One of the highlights of using a bare metal hypervisor is that any problems present in one VM do not affect other VMs running on the hypervisor. This allows the user to run multiple programs all at once on the VMs and multitask without worrying about one of those programs crashing and stopping all the other programs from working. **Section3.1.**

In some settings, a bare metal hypervisor is also referred to as an **embedded hypervisor**. This is because the hypervisor software is embedded into the hardware device. **Section3.1.**

**VMware’s version of a Type 1 hypervisor is called ESXi, and the ‘management layer’ software is called vCenter. Section3.1.**

The second method of virtualization is called hosted virtualization. To set up a computer with hosted virtualization, a Type 2 hypervisor called a hosted hypervisor needs to be installed on top of the operating system that already exists, the host OS, not on top of the hardware like a bare metal hypervisor**. Section3.2**

A **thin client** is a small computer device that is less expensive to acquire than a traditional PC. The thin client functions by relying on the server for processing rather than using its own hardware. **Section3.3**

| **File Type** | **Filename** | **Description** |
| --- | --- | --- |
| Log file | <vmname>.log | Keeps a log of the VM's activity and is used in troubleshooting |
| BIOS file | <vmname>.nvram | This is the file that stores the state of the virtual machine's BIOS. |
| Virtual disk file | <vmname>.vmdk | Stores the contents of the VM's disk drive  A virtual disk is made up of one or more .vmdk files. The number of .vmdk files will depend on the size of the virtual disk. |
| Snapshot file | <vmname>.vmsd <vmname>.vmsn | This is a centralized file for storing information and metadata about snapshots. |
| Suspend state file | <vmname>.vmss | This is the suspended state file, which stores the state of a suspended virtual machine. |
| Configuration file | <vmname>.vmx | Stores information, such as VM name, BIOS information, guest OS type, and memory size. |

Understanding the functions of each of these file types in detail is beyond the scope of this course. However, in order to truly understand how a virtual machine operates in the virtual layer, some knowledge of vmdk and vmx files is helpful, as these will be discussed further in the course.

**Section 3.4.2**

The snapshot feature is most useful when you want to preserve the state of the virtual machine so you can return to the same state repeatedly. To simply save the current state of your virtual machine and then pick up work later with the virtual machine in the same state it was when you stopped, suspend the virtual machine. **Section 3.4.3**

You can take a snapshot while a virtual machine is powered on, powered off, or suspended. A snapshot preserves the virtual machine just as it was when you took the snapshot - the state of the data on all the virtual machine's disks and whether the virtual machine was powered on, powered off, or suspended.

**What Is Captured by the Snapshot?**

The snapshot captures the entire state of the virtual machine at the time you take the snapshot. This includes:

* The state of all the virtual machine's disks.
* The contents of the virtual machine's memory.
* The virtual machine settings.

When you revert to the snapshot, you return all these items to the state they were in at the time you took the snapshot. **Section 3.4.3**

The data center performs three main functions: it processes, stores, and transmits data. This requires three main types of hardware:

1. Compute
2. Storage
3. Network