云计算与虚拟化技术

第9讲：Virtual Machine

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讨论提纲

- **Understanding Virtual Machines**
  - Examining Virtual Machines from the Inside
  - Examining Virtual Machines from the Outside
- **Creating a Virtual Machine**
  - Values / Sizing / Naming / Graphics
  - Installing a Guest Operating System / VMware Tools
- **Managing Virtual Machines**
  - Adding or Registering Existing VMs
  - Changing VM Power States / Removing / Deleting
- **Modifying Virtual Machines**
  - Changing Virtual Machine Hardware
  - Using Virtual Machine Snapshots

1.Understanding VMs　1.1Examining Virtual Machines from the Inside

- From the perspective of software running inside a VM, a VM is really just a collection of virtual hardware resources selected for the purpose of running a guest OS instance.

- By default, VMware ESXi presents the following fairly generic hardware to the VM:

  - Phoenix BIOS
  - Intel 440BX motherboard
  - Intel PCI AHCI controller
  - IDE CD-ROM drive
  - BusLogic parallel SCSI, LSI Logic parallel SCSI, or LSI Logic SAS controller

1.Understanding VMs

- From the perspective of software running inside a VM, a VM is really just a collection of virtual hardware resources selected for the purpose of running a guest OS instance.
- By default, VMware ESXi presents the following fairly generic hardware to the VM:
  - AMD or Intel CPU, depending on the physical hardware
  - Intel E1000, Intel E1000e
  - Standard VGA video adapter
- VMware selected this generic hardware to provide the broadest level of compatibility across the entire supported guest OSs.
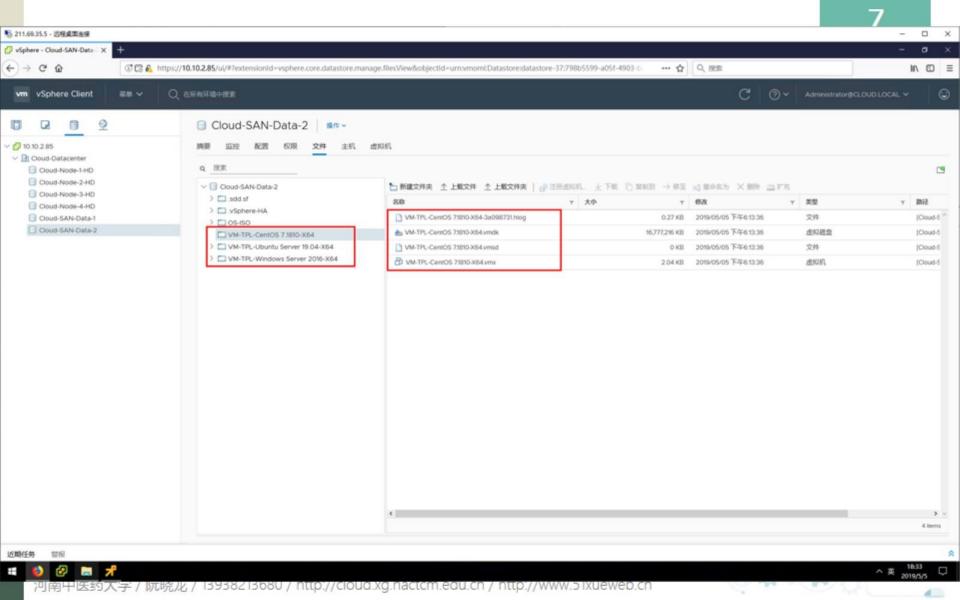
1.Understanding VMs

- A VM can include the following types and numbers of virtual hardware devices:
    - Processors: between 1 and 128 processors with vSphere Virtual SMP (the number of processors depends on your vSphere licenses)
    - Memory: maximum of 6 TB of RAM
    - SCSI controller: maximum of 4 SCSI controllers
    - SATA controller: maximum of 4 SATA controllers
    - Network adapter: maximum of 10 network adapters
    - Parallel port: maximum of 3 parallel ports
    - Serial port: maximum of 32 serial ports
    - Floppy drive: maximum of 2 floppy disk drives on a single floppy disk controller
    - A single USB controller with up to 20 USB devices connected
    - Keyboard, video card, and mouse

1.Understanding VMs

- From the perspective of an ESXi host, a VM consists of several types of files stored on a supported storage device.
  - The two most common files that compose a VM are the configuration file and the virtual hard disk file.
  - The configuration file—hereafter referred to as the VMX file—is a plain-text file identified by a .vmx filename extension, and it functions as the virtual resource recipe of the VM.
  - The VMX file defines the virtual hardware that resides in the VM.
    - The number of processors
    - The amount of RAM
    - The number of network adapters
    - The associated MAC addresses
    - The networks to which the network adapters connect
    - The number, names, and locations of all virtual hard drives are stored in the configuration file

```
encoding = "UTF-8"

config.version = "8"

virtualHW.version = "13"

 nvram = "VM-TPL-CentOS 7.1810-X64.nvram"

pciBridge0.present = "TRUE"

 svga.present = "TRUE"

pciBridge4.present = "TRUE"

 pciBridge4.virtualDev = "pcieRootPort"

 pciBridge4.functions = "8"

pciBridge5.present = "TRUE"

 pciBridge5.virtualDev = "pcieRootPort"

 pciBridge5.functions = "8"

pciBridge6.present = "TRUE"

 pciBridge6.virtualDev = "pcieRootPort"

 pciBridge6.functions = "8"

pciBridge7.present = "TRUE"

 pciBridge7.virtualDev = "pcieRootPort"

 pciBridge7.functions = "8"

vmci0.present = "TRUE"

hpet0.present = "TRUE"
```

```
floppy0.present = "FALSE"

svga.vramSize = "8388608"

memSize = "2048"

powerType.powerOff = "default"

 powerType.suspend = "default"

powerType.reset = "default"

tools.upgrade.policy = "manual"

sched.cpu.units = "mhz"

sched.cpu.affinity = "all"

 sched.cpu.latencySensitivity = "normal"

 vm.createDate = "1557051118317320"

scsi0.virtualDev = "pvscsi"

 scsi0.present = "TRUE"

sata0.present = "TRUE"

 svga.autodetect = "TRUE"

scsi0:0.deviceType = "scsi-hardDisk"

 scsi0:0.fileName = "VM-TPL-CentOS 7.1810-X64.vmdk"

sched.scsi0:0.shares = "normal"

sched.scsi0:0.throughputCap = "off"

scsi0:0.present = "TRUE"
```

20 × 20

20 × 20

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ethernet0.virtualDev = "vmxnet3"

ethernet0.networkName = "VM Network"

ethernet0.addressType = "vpx"

ethernet0.generatedAddress = "00:50:56:b2:f6:89"

ethernet0.uptCompatibility = "TRUE"

ethernet0.present = "TRUE"

sata0:0.startConnected = "FALSE"

sata0:0.deviceType = "cdrom-raw"

sata0:0.clientDevice = "TRUE"

sata0:0.fileName = "emptyBackingString"

sata0:0.present = "TRUE"

displayName = "VM-TPL-CentOS 7.1810-X64"

guestOS = "centos7-64"

toolScripts.afterPowerOn = "TRUE"

toolScripts.afterResume = "TRUE"

toolScripts.beforeSuspend = "TRUE"

toolScripts.beforePowerOff = "TRUE"

uuid.bios = "42 32 0f ff 8b 44 09 49-7b fc 8c 67 75 88 2c 4e"

vc.uuid = "50 32 36 cc 52 21 02 dc-c4 58 53 36 91 60 73 f1"

migrate.hostLog = "VM-TPL-CentOS 7.1810-X64-3a098731.hlog"

sched.cpu.min = "0"

sched.cpu.shares = "normal"

sched.mem.min = "0"

sched.mem.minSize = "0"

sched.mem.shares = "normal"

migrate.encryptionMode = "opportunistic"

20 × 20

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1.Understanding VMs

- From the perspective of an ESXi host, a VM consists of several types of files stored on a supported storage device.
  - Although the VMX file is important, it is only the structural definition of the virtual hardware that composes the VM. It does not store any actual data from the guest OS instance running inside the VM.
  - A separate type of file, the virtual hard disk file, performs that role.
  - The virtual hard disk file, identified by a .vmdk filename extension and hereafter referred to as the VMDK file, holds the actual data stored by a VM.
  - Each VMDK file represents a disk device.

2.Creating a VM

☐ Creating VMs is a core part of using VMware vSphere, and VMware has made the process as easy and straightforward as possible.

  ■ Perform the following steps to create a VM from scratch.pdf

2.Creating a VM

- Creating a Virtual Machine
  - Step by Step
  - Intro
  - VMware Remote Console

2.Creating a VM

- Choosing the right values to use for the number of virtual CPUs, the amount of memory, or the number or types of virtual NICs when creating your new VM can be difficult.
    - Fortunately, there's lots of documentation out there on CPU and RAM sizing as well as networking for VMs.
    - only recommendation is to right-size the VMs based on your needs.

按需配置

2.Creating a VM

2.2Choosing Values for Your New Virtual Machine

☐ Out of all the options available during the creation of a new VM, four areas tend to consistently generate questions from both new and experienced users alike:

- How can I find out how to size my VMs?

- How should I handle naming my VMs?

- How big should I make the virtual disks?

- Does my virtual machine need high-end graphics?

2.Creating a VM

- Sizing Virtual Machines
  - www.vmware.com/products/capacity-planner.html
  - www.microsoft.com/en-us/download/details.aspx?id=7826

2.Creating a VM

- ❑ Naming Virtual Machines
  - ■ Choosing the display name for a VM might seem like a trivial assignment, but you must ensure that an appropriate naming strategy is in place.
    - ❑ We recommend making the display names of VMs match the hostnames configured in the guest OS being installed. For example, if you intend to use the name Server1 in the guest OS, the VM display name should match Server1.
    - ❑ It's important to note that if you use spaces in the virtual display name— which is allowed—then using command-line tools to manage VMs becomes a bit tricky because you must quote out the spaces on the command line.
    - ❑ In addition, because DNS hostnames cannot include spaces, using spaces in the VM name would create a disparity between the VM name and the guest OS hostname.

2.Creating a VM

为了方便虚拟的管理，在云服务器的命名方面也有相关的规范，如下所示：

OpenLabsStudent-10.10.3.111-openOID-WindowsServer2008R2X64ENTCHS

　　　　　　a　　　　　b　　　c　　　　　　d

其中：

a.代表组名称（不加组中间横杠线）；

b.设备使用 IP，如有多个 IP 只写一个；

c.设备用途，写英文名称；

d.操作系统类型、版本(中间不要有空格)。

2.Creating a VM

- Sizing Virtual Machine Hard Disks
  - you should create VMs with multiple virtual disk files to separate the operating system from the custom user/application data.
  - Separating the system files and the user/application data will make it easy to increase the number of data drives in the future and allow a more practical backup strategy.
  - A system drive of 30 GB to 40 GB, for example, usually provides ample room for installation and continued growth of the operating system. The data drives across different VMs will vary in size because of underlying storage system capacity and functionality, the installed applications, the function of the system, and the number of users who connect to the computer.
  - However, because the extra hard drives are not operating system data, it will be easier to adjust those drives when needed.

2.Creating a VM

Virtual Machine Graphics

- In order to provide high-end graphics capabilities to virtual machines, vSphere 6 introduced Virtual Shared Graphics Acceleration (vSGA) and in vSphere 6.5 vGPUs were introduced in partnership with Nvidia. This technology allows you to install physical graphics cards of a specific type into your ESXi host and then offload the processing of 3D rendering to the physical graphics cards instead of the host CPUs. This offloading helps to reduce overall CPU utilization by allowing hardware that is purpose-built for rendering graphics to perform the processing.

- Additional functionality in vSphere 6.7 has been introduced for users of vGPUs with regard to VM mobility. Provided the latest hardware and driver VIBs are loaded in each ESXi host, VMs can now be vMotioned between hosts without needing to be powered off. Although the 3D rendering settings are configured in the settings of a virtual machine, they are intended only for use with VMware Horizon. If you are using a VDI solution other than VMware Horizon, speak to the vendor to learn if 3D rendering on vSphere is supported.

2.Creating a VM

- A new VM is analogous to a physical computer with an empty hard drive. All the components are there but without an operating system. After creating the VM, you're ready to install a supported guest OS.

- The following OSs are some of the more commonly installed guest OSs supported by ESXi (this is not a comprehensive list as there are over 200 supported OSs listed on the vSphere 6.7 Guest OS Compatibility Guide):
  - Windows XP, Vista, 7/8/10
  - Windows Server 2000/2003/2008/2012/2016/2019
  - Red Hat Enterprise Linux 3/4/5/6/7
  - CentOS 4/5/6/7
  - SUSE Linux Enterprise Server 8/9/10/11/12
  - Debian Linux 6/7/8/9
  - Oracle Linux 4/5/6/7
  - Sun Solaris 10/11
  - FreeBSD 7/8/9/10
  - Ubuntu Linux
  - CoreOS
  - Apple OS X/macOS

2.Creating a VM

- VMs have a few ways to access data stored on optical disks. VMs can access optical disks in one of three ways:
  - Client Device
    - This option allows an optical drive local to the computer running the vSphere Web Client to be mapped into the VM. For example, if you are using the vSphere Web Client on your corporate-issued laptop, you can simply insert a CD/DVD into your local optical drive and map that into the VM with this option. This is the quick-and-easy method referenced earlier.
  - Host Device
    - This option maps the ESXi host's optical drive into the VM. VMware administrators would have to insert the CD/DVD into the server's optical drive in order for the VM to have access to the disk. This option is only available from the Hardware Portlet in the VM's Summary tab.

2.Creating a VM

- VMs have a few ways to access data stored on optical disks. VMs can access optical disks in one of three ways:
  - Datastore or Library ISO
    - File These last two options map an ISO image (see the sidebar "ISO Image Basics") to the VM. Although using an ISO image typically requires an additional step—creating the ISO image from the physical disk—nearly all server software is being distributed as an ISO image that can be leveraged directly from within your vSphere environment.

2.Creating a VM

- Installing a Guest OS
  - Use Client Device
  - Use Host Device
  - Use Datastore ISO File
  - Use Library ISO File

2.Creating a VM

- Although VMware Tools is not installed by default, the package is an important part of a VM. VMware Tools offers several great benefits without any detriments. In many cases, these paravirtualized devices do not have device drivers present in a standard installation of a guest OS. The device drivers for these devices are provided by VMware Tools, which is just one more reason why VMware Tools is an essential part of every VM and guest OS installation.

- In other words, installing VMware Tools should be standard practice and not an optional step in the deployment of a VM.

2.Creating a VM

- The VMware Tools package provides the following benefits:
    - Optimized NIC drivers.
    - Optimized SCSI drivers.
    - Enhanced video and mouse drivers.
    - VM heartbeat.
    - VSS support to enable guest quiescing for snapshots and backups. Many VMware and third-party applications and tools rely on the VMware Tools VSS integration.
    - Enhanced memory management.
    - API access for VMware utilities (such as PowerCLI) to reach into the guest OS.

2.Creating a VM

- VMware Tools
  - Installing VMware Tools in Windows
  - Installing VMware Tools in Linux
    - Installing VMware Tools Using Open VM Tools
    - Installing VMware Tools in Linux Using an ISO

3.Managing VMs

- Demo with vSphere Web Client
  - Adding or Registering Existing VMs

3.Managing VMs

- Demo with vSphere Web Client
  - Changing VM Power States

3.Managing VMs

- Demo with vSphere Web Client
  - Removing VMs

3.Managing VMs

- Demo with vSphere Web Client
  - Deleting VMs

4.Modifying VMs

- Demo with vSphere Web Client
  - Changing Virtual Machine Hardware

4.Modifying VMs

- Demo with vSphere Web Client
  - Using Virtual Machine Snapshots