C S 54B: VMWARE VSPHERE INSTALL, CONFIGURE & MANAGE

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2021
Units:	4.5
Hours:	4 lecture, 2 laboratory per week (72 total per quarter)
Advisory:	C S 50A, 50B, 50C.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- The student will demonstrate knowledge of the configuration and use of Virtual Distributed switches in a virtual infrastructure.
- The student will demonstrate the use of vMotion in a virtual infrastructure environment.

Description

This course covers all aspects of server virtualization and draws its examples from VMware vSphere. This hands-on training course explores installation, configuration, and management of VMware vSphere, which consists of VMware ESXi and VMware vCenter Server. The course is based on ESXi and vCenter Server. Completion of this course satisfies the prerequisite for taking the VMware Certified Professional exam. Course is taught by a VMware certified instructor.

Course Objectives

The student will be able to:
A. Explain VMware virtualization
B. Create virtual machines
C. Employ VMware vCenter Server
D. Explain, configure and manage virtual networks
E. Explain, configure and manage virtual storage
F. Demonstrate virtual machine management
G. Apply data protection
H. Differentiate access and authentication control
I. Plan resource management and monitoring
J. Differentiate high availability and Fault Tolerance
K. Identify and configure scalability features
L. Perform patch management
M. Practice installing VMware components

Course Content

A. VMware virtualization
1. Introduce virtualization, virtual machines, and vSphere components
2. Explain the concepts of server, network, and storage virtualization
3. Describe where vSphere fits into the cloud architecture
4. Install and use vSphere user interfaces
B. Virtual machines
1. Introduce virtual machines, virtual machine hardware, and virtual machine files
2. Deploy a single virtual machine
C. VMware vCenter Server
1. Introduce vCenter Server architecture
2. Introduce vCenter Server appliance
3. Configure and manage vCenter Server appliance
4. Manage vCenter Server inventory objects and licenses
D. Configure and manage virtual networks
1. Describe, create, and manage a standard virtual switch
2. Describe and modify standard virtual switch properties
3. Configure virtual switch load-balancing algorithms
E. Configure and manage virtual storage
1. Introduce storage protocols and device names
2. Configure ESXi with iSCSI, NFS, and Fibre Channel storage
3. Create and manage vSphere datastores
4. Deploy and manage the VMware vSphere Storage Appliance
F. Virtual machine management
1. Deploy virtual machines using templates and cloning
2. Modify and manage virtual machines
3. Create and manage virtual machine snapshots
4. Perform VMware vSphere vMotion and Storage vMotion migrations
5. Create a vSphere vApp
G. Data protection
1. Discuss a strategy for backing up ESXi hosts and vCenter Server
2. Introduce the VMware Data Recovery appliance
3. Discuss solutions for backing up virtual machines efficiently
H. Access and authentication control
1. Control user access through roles and permissions
2. Configure and manage the ESXi firewall
3. Configure ESXi lockdown mode
4. Integrate ESXi with Active Directory
5. Introduce VMware vShield Zones
I. Resource management and monitoring
1. Introduce virtual CPU and memory concepts
2. Describe methods for optimizing CPU and memory usage
3. Configure and manage resource pools
4. Monitor resource usage using vCenter Server performance graphs and alarms
J. High availability and Fault Tolerance
1. Introduce new vSphere high availability (HA) architecture
2. Configure and manage a vSphere high availability cluster
3. Introduce VMware Fault Tolerance
K. Configure scalability features
1. Configure and manage a VMware Distributed Resource Scheduler (DRS) cluster
2. Configure Enhanced vMotion Compatibility
3. Use vSphere HA and DRS together
L. Patch management
1. Manage ESXi patching using vCenter Update Manager
2. Install Update Manager and Update Manager plug-in
3. Create patch baselines
4. Scan and remediate hosts
M. Installing VMware components
1. Introduce ESXi installation
2. Describe boot from SAN requirements
3. Introduce vCenter Server deployment options
4. Describe vCenter Server hardware, software, and database requirements

5. Install vCenter Server (Windows based)

Lab Content

A. Install VMware vSphere graphical user interfaces
1. Access your student desktop system
2. Install the vSphere Client
3. Install the Web Client (Server)
B. Configuring VMware ESXi
1. Connect to an ESXi host with the VMware vSphere Client
2. View host hardware configuration
3. Configure DNS and routing information for an ESXi host
4. Configure the ESXi host as an NTP client
C. Working with virtual machines
1. Create a virtual machine
2. Install a guest operating system in a virtual machine
3. Identify a virtual machine's disk format and usage statistics
4. Install VMware Tools into a virtual machine installed with a Windows operating system
5. Enable time synchronization between a virtual machine and an ESXi host
6. Copy programs from CD to your virtual machine
D. Configure VMware vCenter Server appliance
1. Configure the vCenter Server appliance with a web browser
2. Configure vCenter Server appliance to use directory services
3. Register VMware vSphere Web Client with vCenter Server appliance
4. Connect to the vCenter Server appliance with the vSphere Client
E. Using VMware vCenter Server
1. Create a vCenter Server inventory datacenter object
2. Create vCenter Server inventory folder objects
3. Add your ESXi host to the vCenter Server inventory
4. Manage vSphere license keys
F. Standard virtual switches
1. View the current standard virtual switch configuration
2. Create a standard virtual switch with a virtual machine port group
3. Attach your virtual machine to the ProdVMs port group
G. Accessing IP storage
1. Add a VMkernel port group to a standard virtual switch
2. Configure the iSCSI software adapter
3. Configure access to NFS datastores
4. View iSCSI and NFS storage information
H. Managing VMware vSphere VMFSL
1. Review your shared storage configuration
2. Change the name of a VMFS datastore
3. Create a VMFS datastores
4. Expand a VMFS datastore to consume unused space on a LUN
5. Remove a VMFS datastore
6. Extend a VMFS datastore
I. Using templates and clones
1. Create a template
2. Copy Sysprep files to the vCenter Server appliance
3. Create customization specifications
4. Deploy a virtual machine from a template
5. Clone a virtual machine that is powered on
J. Modifying a virtual machine
1. Increase the size of a VMDK file
2. Adjust memory allocation on a virtual machine
3. Rename a virtual machine in the vCenter Server inventory
4. Add a raw LUN to a virtual machine and verify that the guest operating system can see it
5. Expand a thin-provisioned virtual disk
K. Migrating virtual machines

1. Create a virtual switch and VMkernel port group for vMotion migration
2. Verify that your ESXi host meets vMotion requirements
3. Verify that your virtual machines meet vMotion requirements
4. Perform a vMotion migration of a virtual machine
5. Migrate virtual machine files with Storage vMotion
L. Managing virtual machines
1. Unregister a virtual machine in the vCenter Server inventory
2. Register a virtual machine in the vCenter Server inventory
3. Unregister and delete virtual machines from disk
4. Take snapshots of a virtual machine
5. Revert to a snapshot
6. Delete an individual snapshot
7. Using the Delete All function in Snapshot Manager
M. Access control
1. Configure an ESXi host to use directory services
2. Use Active Directory accounts to verify proper access to your ESXi host
3. Create a custom role in vCenter Server appliance
4. Assign permissions on vCenter Server inventory objects
5. Verify permission usability
N. Resource pools
1. Create CPU contention
2. Create a resource pool named Fin-Test
3. Create a resource pool named Fin-Prod
4. Verify resource pool functionality
O. Monitoring virtual machine performance
1. Use vCenter Server to monitor CPU utilization
2. Undo changes made to your virtual machines
P. Using alarms
1. Create a virtual machine alarm that monitors for a condition
2. Create a virtual machine alarm that monitors for an event
3. Trigger virtual machine alarms and acknowledge them
4. Disable virtual machine alarms
Q. Using vSphere high availability (HA)
1. Create a cluster enabled for vSphere HA
2. Add your ESXi host to a cluster
3. Test vSphere HA functionality
4. Prepare for the next lab
R. vSphere Distributed Resource Scheduler (DRS)
1. Create a DRS cluster
2. Verify proper DRS cluster functionality
3. Create, test, and disable affinity rules
4. Create, test, and disable anti-affinity rules
5. Create, test, and disable virtual machine to host affinity rules
S. VMware vCenter Update Manager
1. Install Update Manager
2. Install the Update Manager plug-in in the vSphere Client
3. Modify cluster settings
4. Configure Update Manager
5. Create a patch baseline
6. Attach a baseline and scan for updates
7. Stage patches onto ESXi hosts
8. Remediate ESXi hosts
T. Installing VMware vCenter Server
1. Access your vCenter Server system
2. Configure a SQL Server ODBC connection to a remote database
3. Install vCenter Server

Special Facilities and/or Equipment

A. Access to a network laboratory with current Cisco network equipment host computers required to support the class.

B. Website or course management system with an assignment posting component (through which all lab assignments are to be submitted) and a forum component (where students can discuss course material and receive help from the instructor). This applies to all sections, including on-campus (i.e., face-to-face) offerings.

C. When taught via Foothill Global Access on the Internet, the college will provide a fully functional and maintained course management system through which the instructor and students can interact.

D. When taught via Foothill Global Access on the Internet, students must have currently existing email accounts and ongoing access to computers with internet capabilities.

Method(s) of Evaluation

Tests and quizzes
Written laboratory assignments
Final examination

Method(s) of Instruction

Lectures which include motivation for the architecture of the specific topics being discussed

In-person or online labs (for all sections, including those meeting face-to-face/on-campus), consisting of:

1. An assignment webpage located on a college-hosted course management system or other department-approved internet environment. Here, the students will review the specification of each assignment and submit their completed lab work

2. A discussion webpage located on a college-hosted course management system or other department-approved internet environment. Here, students can request assistance from the instructor and interact publicly with other class members

Detailed review of laboratory assignments which includes model solutions and specific comments on the student submissions

In-person or online discussion which engages students and instructor in an ongoing dialog pertaining to all aspects of designing, implementing and analyzing programs

When course is taught fully online:

1. Instructor-authored lecture materials, handouts, syllabus, assignments, tests, and other relevant course material will be delivered through a college-hosted course management system or other department-approved internet environment

2. Additional instructional guidelines for this course are listed in the attached addendum of CS department online practices

Representative Text(s) and Other Materials

VMware. VMware vSphere 7: Install, Configure, Manage. 2020.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Reading
1. Textbook assigned reading averaging 50 pages per week.
2. Online resources as directed by instructor though links pertinent to networking.
3. Library and reference material directed by instructor through course handouts.
B. Writing

1. Technical prose documentation that supports and describes the laboratory exercises that are submitted for a grade.

Discipline(s)

Computer Science