

This 5-day class is an intense introduction to virtualization using VMware's vSphere™ 4.1 including VMware ESX™ 4.1 and vCenter™. Assuming no prior virtualization experience, this class starts with the basics and rapidly progresses to more advanced topics. More than 40% of class time is devoted to labs so concepts, skills and best practices are developed and reinforced. Initial labs focus on installation and configuration of stand-alone ESXi servers. As the class progresses, shared storage, networking and centralized management are introduced. The class continues on to more advanced topics including resource balancing, high availability, backup and recovery, troubleshooting and more. Disaster recovery, rapid deployment, hot migration and workload consolidation are also covered. This class is unique in its approach; which is to identify common IT pain points and then clearly explain and demonstrate how virtualization delivers clear, tangible benefits (e.g.: reduced costs, greater consistency, responsiveness, reduced administration, server consolidation, etc.). Each topic is presented from the perspective of delivering key business value; not just the technical or mechanical aspects of the software. By the end of the class, attendees will have learned the benefits, skills, and best practices of virtualization. Attendees will be able to design, implement, deploy, configure, monitor, manage and troubleshoot VMware vSphere 4.1.

Course Objectives:

- Explain the many significant benefits of virtualization.
- Install ESXi Server according to best practices.
- Configure and manage local storage.
- Create virtual, distributed virtual and virtual to physical LAN segments.
- Understand and use shared SAN storage including Fibre SAN, iSCSI SAN.
- Define and use file share (NAS) datastores.
- Install, configure, and administer VMware vCenter.
- Create virtual machines, install operating systems and applications.
- Rapidly deploy VMs using golden-master templates.
- Create clones - one-time copies of virtual machine.
- Perform VM cold migrations, hot migrations and Storage VMotion.
- Configure, manage, monitor and secure users and groups.
- Deploy and use VMware Data Recovery to back up and recover VMs.
- Create and manage load balanced clusters.
- Manage power consumption with Distributed Power Management.
- Understand, create and manage high availability clusters to protect against VM service loss caused by ESXi server failures.
- Monitor and tune both ESXi and virtual machine performance.
- Patch and update ESXi servers using vCenter Update Manager.
- Understand how VMware and third party products, including operating systems, are impacted by virtualization.
- Troubleshoot common problems.

Audience: System architects, security specialists, operators, performance and capacity analysts, backup administrators, business continuity specialists, storage administrators, managers who need an unbiased understanding of virtualization.

Prerequisites: Attendees should have user, operator or administrator experience on common operating systems such as Microsoft Windows®, Linux™, UNIX™, etc. Experience installing, configuring and managing operating systems, storage systems and or networks is useful but not required. We assume that all attendees have a basic familiarity with PC server hardware, disk partitioning, IP addressing, O/S installation, networking, etc.

Number of Days: 5 days

1. Introduction to VMware vSphere

- Server Resource Utilization
- Server Consolidation
- OS, Apps Tied to PC Server
- Datacenter Issues
- OS, Application Imaging
- Back Up & Recovery
- Server Refresh
- Hardware Maintenance
- High Windows OS Costs
- MS Virtualization Calculator
- Disaster Recovery
- Test, Development & QA
- IT Technical Career Benefits
- vSphere Components
- VMware ESXi
- VMware vSphere 4.1 Editions
- vSphere Hardware Limits
- Small Business Bundles
- VMware vCenter
- Single Host Deployment
- Multiple ESXi w. Shared Storage
- Full vSphere
- Cloud Computing
- Storage Cloud
- Server Cloud
- Network Cloud

2. VMware ESXi

- ESXi Block Diagram
- Scalable ESXi Deployment
- ESXi Server Hardware
- ESXi vs. ESX
- ESXi Install Steps

- ESXi Set Root Password
- Default Management IP Settings
- Configure Management Network
- Select Management NIC(s)
- IP Configuration
- DNS Configuration
- Custom DNS Suffixes
- Apply Network Changes
- Test Management Network
- Restart Management Agents
- Alt-F12 VMkernel Log Entries
- Login with vSphere Client
- vSphere Client - ESXi
- ESXi – Configuration
- Local ESXi Users & Groups
- Joining a Domain
- Licensing ESXi 4.1
- Sizing ESXi CPU, Memory
- System Health Status
- Physical CPU Properties
- Physical Memory Properties
- Network Adapters

3. Networking

- vNetwork Switches
- Standard vSwitches
- Distributed vSwitches
- Physical Networking
- Virtual Networking
- ESXi Networking
- Isolated Virtual Networking
- Outbound Virtual Networking
- Outbound Teamed Networking
- vSwitch Properties

- Multi-homed Networking
- High Performance Networking
- vSwitch Connection Types
- Port Groups
- Network View
- vSwitch Properties
- Add Network Wizard
- ESXi Physical NICs
- vSwitch Rules

4. Network Attached Storage (NAS) / Network File System (NFS)

- Basic ESXi Deployment
- Network Attached Storage
- NAS Options
- Network File System
- NAS/NFS Uses
- NAS Components
- Defining NFS Shares on Linux
- NFS VMkernel Port
- Define an NFS Share
- NFS Share in Storage Roster
- Unmount an NFS Share
- NAS/NFS Trade-offs
- Troubleshooting NFS

5. Virtual Machines

- Virtual Machines
- Virtual Hardware
- Installing a Guest Operating System
- Installing VMware Tools
- VM File Copy
- Datastore Browser
- New Virtual Machine Wizard
- VM Wizard - CPUs
- VM Wizard – Memory
- VM Wizard – Disk
- Virtual Disk Snapshots
- Snapshots Manager
- Complete the Virtual Machine
- Remote Console
- Virtual Machine BIOS
- Install Guest OS
- VM Running with Stock Drivers
- VMware Tools
- VMware Tools – Time Sync
- VMware Tools – Connections
- VMware Tools – Scripts

**6. ESXi 4.1 Supports USB
Windows Performance Tips
Central Management with vCenter**

- vCenter
- Licensed Add On Features
- vCenter Diagram
- vCenter Deployment
- vCenter HW Requirements
- Supported Databases
- MS SQL Databases
- MS SQL Express
- vSphere is a Management Proxy
- Don't Bypass vCenter
- Database Size Estimates
- Launch vCenter Installer
- Install/Select Database
- Isolated or Linked Mode
- vCenter uses a Java VM
- vSphere Client Plugins
- vCenter Server Services
- Web Access

7. Templates, Clones

- VM Rapidly Deployment
- Template Theory
- Disk Formats
- Creating a New Template
- Template Properties
- Deploy VM from Template
- Clone a VM
- Clone a Template
- Template Maintenance
- Windows VM Customization
- Linux, Solaris OS Customization
- Pre-Built Virtual Machines
- Virtual Appliance Pros & Cons
- Import/Export Virtual Appliances
- Editing Virtual Hardware
- Virtual Machine Options
- Virtual Machine Resources
- Hot Add Virtual Hardware
- Raw Device Map (RDM)
- Hot Grow Disks

8. Permissions

- Security & Permission Model

- Permissions - Privileges
- Permissions - Roles
- Permissions - Users
- Assigned Permissions
- Determining Permissions
- Selecting Local, Domain Users
- Privilege Hierarchy
- Role Assignments
- Work with Roles
- Edit a Role
- vCenter Users, Groups
- Checking Permissions
- View vCenter Base Permissions
- ESXi Users, Groups
- ESXi Default Permissions

9. Advanced Networking

- Distributed Virtual Switches
- DvSwitch Port Groups, Uplinks
- Building a New dvSwitch
- Originating Port Forwarding
- Forward Based on MAC Hash
- Forward Based on IP Hash
- IP Hash Forwarding
- Physical NIC Load Forwarding
- Active and Standby NICs
- Network Failure
- Resilient Network Configuration
- Notify Switches
- Standard vSwitch VLANs
- VLANs & VLAN Trunking
- Create Private VLANs

10. Shared Storage

- Fibre & iSCSI SAN Shared Storage
- Fibre Storage Area Networks
- Fibre San Block Diagram
- World Wide Names
- Runtime Hardware Paths
- Fibre HBAs
- Storage Volumes
- Storage Device Properties
- iSCSI
- iSCSI Capabilities
- iSCSI Motivation
- iSCSI Redundancy Options
- iSCSI Qualified Names
- LUN Discovery Options

- iSCSI Hardware Initiators
- iSCSI Software initiators
- iSCSI Ports
- Enable iSCSI SW Adapter
- Change iSCSI SW Adapter IQN
- Enter IP Address of SAN SPs
- Challenge Auth. Protocol
- CHAP Authentication Process
- Enter your iSCSI Credentials
- Scan iSCSI SAN
- New iSCSI LUNs
- iSCSI Trade-offs
- Troubleshooting iSCSI
- Storage Views
- Boot From SAN
- Fibre Boot From SAN
- iSCSI Boot From SAN
- Set Boot Controller Order

11. VMFS – VMware File System

- VMware File System
- Shared Storage
- VMFS Features
- VMFS Auto Discovery
- Building a VMFS
- Select Disk/LUN
- VMFS Settings
- New VMFS
- VMFS Details
- VMFS Capacity Management
- LUN Span – Before & After
- Create/ Grow a LUN Span
- To Add an Extent - 2
- To Add an Extent - 3
- Spanned LUNs - FYI
- Option 2 – Grow Volume, VMFS
- Grow Volume then Grow VMFS
- VMFS Consumes Free Space
- Multipathing
- Fibre SAN Multipathing
- iSCSI SAN Multipathing
- Manage Hardware Paths
- Path Selection Policy
- Pluggable Storage Architecture

12. Resource Pools

- Resource Administration

- Resource Delegation
- CPU Resource Tunables
- Physical to Virtual CPU Service
- Dynamic Memory Balancing
- VM Memory Tunables
- Memory Resource Tunables
- Shares
- Resource Pools
- Resource Pool Settings
- Expandable Reservations
- Why Use Resource Pools
- Auto-Update Resource Pools
- CPU Resource Allocations
- Memory Resource Allocations
- Storage Resource Allocations
- Virtual Hardware Resources
- Resource Pool Summary Tab

13. VM Migration

- Cold Migration
- Why Cold Migrate
- VMotion Migration
- VMotion Benefits
- VMotion Requirements
- VMotion Scenario
- Memory Pre-copy
- Progress is Monitored
- VM is Descheduled
- VM Context is Transferred
- Switch Over
- VM Scheduled to Run
- Housekeeping
- VMotion Experience
- Failed Validation
- Validation Warnings
- Host Compatibility
- CPU Compatibility
- CPU Identification Utility
- Storage VMotion
- Storage VMotion Scenarios

14. Distributed Resource Scheduler

- DRS Goals
- DRS Clusters
- DRS Functions
- DRS Automation Level
- Migration Threshold
- Power Management

- EVC and AMD CPUs
- EVC for Intel CPUs
- EVC Benefits
- DRS EVC Requirements
- VM Swapfile Location
- Affinity, Anti-Affinity Rules
- DRS Groups Manager
- Per-VM Overrides
- DRS Cluster Summary Tab
- CPU/RAM Host Distributions
- Resource Allocation Tab
- DRS Tab
- DRS History
- Resource Management
- Adopting DRS
- DRS Best Practices

15. VMware High Availability Clusters

- HA VM Requirements
- Enabling HA Fail Over
- VMware HA Host Failures
- Host Failures Allowed
- HA Reserve Resources
- HA Cluster Heartbeat
- HA Restart Priority
- HA Isolation Response
- VM Monitoring
- How Isolation Response Works
- ESXi Console NIC Failure
- VM Powered off When Isolated
- Move, Power on VM
- Adding a Host to a Cluster
- Maintenance Mode
- Resolving HA Problems
- HA and DRS
- Isolation Response Issues
- Best Practices
- VMware Fault Tolerance

16. Consolidation

- Guided Consolidation
- Select Domains/Workgroups
- Selecting Hosts in a Domain
- Set Authentication
- Monitored Host Roster
- Migrating Monitored Hosts
- Target Host Recommendations

- Converting the Physical Host
 - Enterprise Planning/ Migration
- 17. Data Recovery**
 - Backup and recovery
 - VM Backup Challenge
 - Traditional Network Backup
 - Reduce Backup Stress
 - ESXi Backup
 - VMware Consolidated Backup
 - VMware Converter Restore
 - ESXi Configuration Back Up
 - Data Recovery
 - Setting up VM Data Recovery
 - VM DR Set Up
 - VMDR Web UI
 - Connect VMDR to vCenter
 - Getting Started Wizard
 - Creating a Backup Job
 - Backup Retention Policy
 - Backup Reports
 - Restoring a Virtual Machine
 - Restore Task
- 18. Converter**
 - VMware vCenter Converter
 - Clone & Update Disks
 - Install and Enable Converter
 - Manage Plug-ins
 - Converter Steps
 - Prepare for Conversion
 - Launch Converter Enterprise
 - Profile Physical Machine
 - Select Host, Add Credentials
 - Set Target ESXi Host, Datastore
 - Set Target VM Properties
 - Clone Physical Disk(s)
 - Resize Target VM Disk
 - Copying Disk Volumes
 - Create the New Virtual Machine
 - VM Reconfiguration
 - Guest OS Customization
 - Converter Housekeeping
 - New VM Housekeeping
 - Converter Caveats
 - Trouble Spots
- 19. vSphere Alarms**
 - Performance Alarms
- vCenter Alarms
 - Adding an Alarm
 - Alarm Settings
 - ESXi Host Alarms
 - Virtual Machine Alarms
 - Alarm Reporting
 - Set Alarm Actions
 - Triggered vCenter Alarms
 - Default Alarms
 - Set E-Mail Properties
 - Set SNMP Properties
 - Change Custom Alarms
 - Acknowledge Alarms
 - Alarm Best Practices
- 20. Update Manager**
 - Patch Management
 - VUM Components
 - Install VUM
 - VUM Storage
 - VUM Storage Estimator
 - Install, Enable VUM Plug-in
 - Configure VUM
 - ESX Host/Cluster Settings
 - Patch Baselines
 - New Baseline
 - Patch Options
 - Selected Patches – Fixed
 - Attach a Baseline
 - Scan for Compliance
 - Compliance Scan Complete
 - Schedule VUM Tasks
 - VUM and DRS Clusters
 - Update Manager
- 21. Performance Analysis**
 - Performance Tuning
 - ESXi CPU Usage Strategy
 - Active VM CPU Scheduling
 - Physical to Virtual CPU
 - Sequential vs Concurrent Tasks
 - CPU Over Commit
 - Physical Memory
 - Virtual Machine Memory
 - VM Memory Over Commit
 - Physical RAM to VM Allocation
 - Transparent Page Sharing
 - Memory Ballooning

- Memory Compression
- VMkernel Swap
- Ballooning vs. VMkernel Swap
- Disk I/O Bandwidth Contention
- Overview Performance Charts
- Advanced Performance Charts
- Performance Chart Options
- Performance Problems
- Tracking VM CPU Ready Time
- CPU Ready VM Experience
- To Resolve CPU Over Commit
- Monitoring Memory Stress
- Memory Ballooning – Overview
- Ballooning & Swapping
- Page Faults in Task Manager
- VM CPU, Memory Consumption
- Best Practices

22. Final Thoughts

- What to Virtualize
- One to One Virtualization
- CPU Considerations
- Memory Considerations
- Storage Considerations
- Network Considerations
- Server Capacity Management
- VM High Availability
- Virtualization Security Issues