

VMware Enterprise Professional Blueprint Outline v3.0

Section 1 – Security

Objective 1.1 – Install and configure ESX Server, VirtualCenter, and Virtual Machines to meet set security design requirements.

Knowledge

- Describe how to provide information needed for intrusion detection system configuration including firewall configuration

Skills and Abilities

- Enable root SSH login
- Modify the default settings to allow both incoming and outgoing SSH traffic
- Configure firewall
 - Define Firewall rules
 - Command Line
 - VI client
- Create ESX Server user accounts and assign group memberships
 - Command Line
 - VI client
- Define VI Client roles and user and group assignments
- Configure TCP wrappers
- Configure pluggable authentication modules
 - Enable directory services
 - Password policy
- Setup SSL certificates
- Configure advanced vNIC security attributes
 - promiscuous mode
 - Static MAC addresses
 - Spoofing
- Determine and set appropriate virtual networking security
 - Forged transmit configuration
 - promiscuous mode
 - MAC address change
 - VLAN configuration
- Configure centralized log auditing
- Disable copy and paste operations for virtual machines remote consoles

Tools

- Service Console based editing tools
- VirtualCenter
- VI client
- Web access client

Objective 1.2 – Perform ongoing Virtual Infrastructure security measures and respond to security threats.

Knowledge

- Describe how to obtain the current security configurations
- Differentiate between standard Linux and Service Console security models

Skills and Abilities

- Monitor, collect and analyze security entries for violations in the VirtualCenter and ESX Server log sets
- Maintain user accounts, groups and roles
- Configure ESX services
 - Configure SNMP security measures
 - Configure NTP to guarantee log time entries are correct
- Locate and install security patches
- Determine the necessity and feasibility of the security fix for a particular environment.
- Respond to virtual infrastructure security threats
- Modify ssh access

Decisions

- Select appropriate log monitoring tools

Tools

- Log monitoring tools

Objective 1.3 – Troubleshoot Virtual Infrastructure configurations and intrusion threats and collect forensic evidence.

Knowledge

- Given a VMware VI release, describe the process to stay current with security notifications
- Describe the process of preserving forensic evidence using virtualization technologies such as cloning

Skills and Abilities

- Interpret log entries
- Given a scenario, modify configurations to correct security issues
- Troubleshoot common security issues
 - Improper network configurations
 - VMotion traffic
 - IP-Based Storage
 - Management traffic
- Install antivirus in a Virtual Machine
- Install antivirus in the Virtual Infrastructure components

Decisions

- Determine appropriate response to system configuration and log analysis

Tools

- VI Client
- Command Line

Section 2 – Storage

Objective 2.1 – Install and configure ESX Server and Virtual Machines to meet storage design requirements.

Knowledge

- Describe how to identify iSCSI, Fibre channel, and NFS configurations using CLI commands and log entries
- Describe the VMFS file system
 - Metadata
 - Multi-access
 - Locking
 - Tree structure and files
 - Applicability to clustered environment
 - Journaling
- Describe how a VCB staging area is used

Skills and Abilities

- Create RDM
 - Virtual compatibility mode
 - Physical compatibility mode
- Perform advanced multi-pathing configuration
 - Override a default policy
 - Fixed versus MRU
 - Change an active path
 - Enable and disable a path

- Load and unload drivers
- Verify SAN LUNs accessibility
- Verify multi-pathing configuration to meet the HCL requirements
- Manage VMFS file system via the command line
 - Create a VMFS label
 - Extend the VMFS volume
- Configure NFS datastores using the command line
- Configure iSCSI hardware and software initiators using the command line
- Create virtual machine templates
 - Determine whether to use thin or thick provisioning
 - Maintain templates
- Use proc nodes to identify storage vendor and array model
- Verify storage configuration using CLI, VI client and server log entries
- Install and configure VMware Consolidated Backup (VCB)
- Configure Virtual Machine clusters
 - Deploy N +1 cluster (physical to virtual) on VI3
 - Deploy a 2- node cluster using MSCS on VI3
 - Cluster in a box
 - Cluster across boxes

Decisions

- Decide placement of new virtual machines to meet resource requirement design
- Decide placement of clustered virtual machines to meet resource requirement design

Tools

- VI client
- CLI
 - vm-support script
 - esxcfg-*
 - dd
 - fdisk
 - vmkfstools

Objective 2.2 – Perform ongoing storage monitoring and maintenance operations.

Knowledge

- Identify and document SAN and hardware iSCSI multi-pathing configurations using CLI
- Identify and document NAS and iSCSI configurations using CLI
- Identify relevant log locations and content

Skills and Abilities

- Create and maintain backups for VMFS metadata, virtual machine configurations and server configurations
 - use dd to create binary dumps of VMFS volumes
- Monitor and analyze log entries for predictive analysis
- Monitor VirtualCenter alerts
- Monitor virtual machine logs
- Monitor and evaluate file system content for usage compliance and space availability
- Perform disaster recovery validation tests according to design policy

Tools

- VI client
- CLI
 - vm-support script
 - esxcfg-*
 - dd
 - fdisk
 - vmkfstools
 - text editor

Objective 2.3 – Troubleshoot Virtual Infrastructure storage components.

Skills and Abilities

- Troubleshoot ESX to FC SAN Connection using CLI , VI Client and logs
- Troubleshoot ESX to ISCSI Connection using CLI , VI Client and logs
- Troubleshoot ESX to NAS Connection using CLI , VI Client and logs
- Identify and correct addressing and access control
- Troubleshoot RDM configuration
- Test interoperability between VCB Proxy Server, ESX Server, VirtualCenter Server
- Interpret the log entries for configuration validation and predictive analysis
- Troubleshoot file system errors using logs and CLI

- Troubleshoot storage problems using CLI, logs and VI Client

Tools

- VI client
- CLI
 - vm-support script
 - esxcfg-*
 - dd
 - fdisk
 - vmkfstools
 - iostat
 - vdf
- VCB troubleshooting tools
 - vcbVmNames
 - vcbMounter
 - others

Section 3 – Management and Operations

Objective 3.1 – Install and configure ESX Server, VirtualCenter instances.

Knowledge

- Explain the various ESX installation methods
- Describe the use criteria for resource pools
- Describe the use criteria for high availability
- Describe the use criteria for Virtual SMP
- Describe how to use VirtualCenter monitoring graphs
- Describe how to use VirtualCenter topology maps
- Describe the different VirtualCenter alerts

Skills and Abilities

- Configure complex resource pools
- Deploy complex resource pools
- Deploy a complex DRS cluster
- Deploy a complex HA cluster
- Enable SNMP traps in ESX and VirtualCenter
- Configure VirtualCenter to use SNMP
- Configure VirtualCenter to use SMTP
- Configure boot from SAN
- Use CLI to locate hardware locations on the PCI BUS
- Configure VirtualCenter to use supported databases
- Use Service Console command line tools for advanced configuration

- Configure different VirtualCenter alerts

Tools

- VI client
- CLI
 - vm-support script
 - esxcfg-*
 - dd
 - fdisk
 - vmkfstools
- VCB troubleshooting tools
 - vcbnames
 - vcbmount
 - others

Objective 3.2 – Troubleshoot management and operational issues.

Knowledge

- Describe the ESX Server boot process
- Identify key components of esxtop output for resource and performance analysis
- Differentiate between monitoring within a guest vs. monitoring within the virtual infrastructure
- Describe how to identify issues using both system and application logs
- Identify the source of the problem
 - Hardware
 - Guest OS
 - Application
 - VM configuration
 - Virtual Infrastructure configuration
 - Resources

Skills and Abilities

- Modify and customize the ESX Server boot menu options
 - Single user mode
 - Debug kernel
- Troubleshoot performance issues using esxtop with VI Client and GUI monitoring tools
- Collect Virtual Machines' performance snapshots using vm-support script
- Troubleshoot VirtualCenter utilization of SNMP
- Troubleshoot VirtualCenter utilization of SMTP
- Troubleshoot complex HA clusters
- Troubleshoot complex DRS clusters
- Troubleshoot licensing issues

Decisions

- Decide when to use guest monitoring vs. virtual infrastructure monitoring

Tools

- VM-support script
- VI client
- CLI
 - esxcfg-*
- VCB troubleshooting tools
 - vcbnames
 - vcbmount
 - others
- logs

Objective 3.3 – Assess, monitor and report on the Virtual Infrastructure health.

Knowledge

- Assess performance for resource planning to meet the design requirements
- Locate and explain the various ESX Server and VirtualCenter configuration files

Skills and Abilities

- Use esxtop to monitor the health of the ESX Server
- Analyze centralized log and event audits
- Generate reports and collate data from VirtualCenter
 - Alarms
 - Resource utilization
 - Performance
 - Topology Maps
- Compare monitoring results to thresholds defined by the design guidelines

Tools

- esxtop
- Performance graphs
- Logs
- CLI
 - esxcfg-*

Objective 3.4 – Operational Maintenance

Knowledge

- Explain what is stored in the VirtualCenter database and the impact of varying sizes of an infrastructure on the database.
- Understand how to obtain virtual infrastructure components.
- Understand the phases and components impacted by an upgrade.
 - VirtualCenter and associated database
 - ESX host
 - VMFS Datastores
 - Virtual Machine
 - Virtual machine hardware
 - VMware tools
- Understand how to respond to alerts generated from your virtual infrastructure
 - Lab manager
 - VCB proxy
 - VirtualCenter
 - ESX Server logs
- Understand the impact of configured/scheduled events from within VirtualCenter
- Understand the impact of configured alarms from within VirtualCenter
- Explain the situation where database pruning is required
- Describe the various mechanisms for backing up a VirtualCenter database.

Skills and Abilities

- Create and schedule VirtualCenter events
- Backup a VirtualCenter database
- Restore a VirtualCenter database
- Configure VirtualCenter alarms

Tools

- VirtualCenter
- Database tools
- esxupdate
- vm-support
- esxcfg-* toolset

Section 4 – Networking

Objective 4.1 – Install and configure Virtual Infrastructure networks.

Knowledge

- Describe various virtual switch configuration options
 - Policy
 - Port groups
 - VLAN
- Explain the ISO 7 layer model
- Explain general network topology
- Identify routing protocols
- Explain the role of trunk ports in ESX Server
- Explain the role of link aggregation in ESX Server

Skills and Abilities

- Configure service console network using CLI
- Configure VLAN (virtual network)
- Configure various virtual switch configuration options
 - Policy
 - Port groups
 - VLAN
- Configure NIC teaming
 - Failover
 - Load Balance

Tools

- CLI
 - esxcfg-vswif
 - esxcfg-vswitch
 - esxcfg-route
- VI client

Objective 4.2 – Manage and monitor Virtual Infrastructure network operations.

Knowledge

- Explain the use of complex configurations of Virtual Switch ports
- Describe and traverse the virtual infrastructure network topology

Skills and Abilities

- Monitor traffic over a Virtual Switch

- Bandwidth
- Dropped packets
- Analyze network traffic from Virtual Machines
- Monitor the available Virtual Switch ports to meet design requirements
- Monitor logs and events
- Use esxtop to monitor resource and performance statistics
- Expand the virtual infrastructure according to the design plan
- Create backup of configuration files using vm-support script

Tools

- esxtop
- CLI
 - esxcfg-vswif
 - esxcfg-vswitch
 - esxcfg-route
 - vm-support script
- VI client

Objective 4.3 – Network Troubleshooting

Knowledge

- Identify appropriate networking analysis tools
- Describe correct usage of networking tools

Skills and Abilities

- Analyze network traffic from Virtual Machines
- Troubleshoot service console network using CLI
- Troubleshoot complex configurations of Virtual Switch ports
- Troubleshoot VLAN configurations and issues
- Monitor traffic over a Virtual Switch
 - Bandwidth
 - Dropped packets
- Identify and resolve network issues using network monitoring tools
 - tcpdump
 - Snoop

Tools

- CLI
 - tcpdump
 - ifconfig
 - traceroute
 - hostname

- nslookup
- dig
- netstat
- iostat
- ping
- arp
- VI Client

Section 5 – Server and Platform

Objective 5.1 – Install and configure VirtualCenter and License Server.

Knowledge

- Describe the component dependencies
 - Database server
 - License server
 - Active Directory
 - DNS Server
 - NTP Server
- Explain VirtualCenter installation best practices

Skills and Abilities

- Confirm the database server is prepared for the VirtualCenter install according to the design requirements
 - Configure and verify the ODBC connectivity
- Install and configure License Server
- Configure and verify licensing
- Migrate from host based to server based licensing
- Add ESX Servers to datacenters according to design plan
- Map VirtualCenter roles to Active Directory users and groups

Objective 5.2 – Install and configure ESX Server.

Knowledge

- Explain the different installation methods
- Identify and document SAN and hardware iSCSI multi-pathing configurations using CLI
 - Identify the appropriate configuration for shared storage using CLI
 - NAS
 - iSCSI
 - SAN
- Identify relevant log locations and content

Skills and Abilities

- Set up hardware and various connections
 - Boot from SAN
 - Layout of local drives in various raid configurations
 -
- Update firmware and BIOS
 - Flash
 - HBA's
 - Remote Management interfaces
- Deploy and create an ESX server automated build using various media types and methods
 - USB drives
 - CDROM
 - Network install
 - Scripted install
- Configure Service Console components of an ESX server
 - Network Time Protocol (NTP)
 - DNS
 - SNMP
 - Syslogs
- Install supported third party agents according to the design plan
- Verify cards are installed in the appropriate BUS slot according to design plan
 - BUS type
 - BUS speed
- Verify memory distribution on the BUS
- Verify CPU compatibility between NUMA nodes
- Perform acceptance tests

Tools

- VI client
- CLI

Objective 5.3 – Install and configure VCB Proxy Server Platform.

Knowledge

- Explain VCB capabilities and limitations.
- Explain how to integrate VCB with
 - Third-party backup software
 - VirtualCenter
 - VMFS Storage
- Explain VMware Converter based restores

Skills and Abilities

- Verify sizing of VCB holding tanks based on full VM backup requirements
- Perform integration tests
 - VCB to VirtualCenter
 - VCB to Third-party backup software
 - VCB to VMFS Storage
- Analyze VCB logs to verify functionality
- Install VCB integration models as specified
- Verify specified concurrent number of VCB based backups matches expected capabilities
- Review multipathing configuration
- Run performance tests and discuss results with architect for design improvement
- Configure Windows not to install drive letters using diskpart
- Configure a VCB backup role into VirtualCenter

Tools

- VCB commands
- VI client
- Diskpart
- VMware Converter

Objective 5.4 – Troubleshoot issues with VirtualCenter, ESX Server and VCB Proxy Server.

Knowledge

- Explain the architectural flow of virtual infrastructure components and their dependencies
- Interpret *bash* scripts
- Interpret Windows batch/cmd files
- Explain how to use advanced logging options

Skills and Abilities

- Troubleshoot VirtualCenter alarms
- Troubleshoot custom VirtualCenter roles
- Troubleshoot VirtualCenter errors
 - Use `vpxd -s`
 - Enable advanced logging options
- Troubleshoot VMware Converter errors
- Interpret performance graphs
- Identify issues from within a set of log files (ESX and VirtualCenter)
- Troubleshoot advanced ESX Server installation and operational issues
- Troubleshoot advanced VCB Proxy Server installation and operational issues

- Command line logging options (-L)
- Map architectural flow to the appropriate log files

Tools

- vpxd command line options
- VCB commands
- Windows event viewer logs

Section 6 – Application and Virtual Machines

Objective 6.1 – Install and configure Virtual Machines to meet Virtual Machine build requirements.

Knowledge

- Describe the functions of key values in a virtual machine configuration file
- Explain the maximum resource settings
- Explain P2V technologies
 - P2V
 - VMware converter

Skills and Abilities

- Update a virtual machine configuration file to meet changing resource requirements
- Install VMware Tools
 - Configure time synchronization with time source
- Install vmxnet driver
- Configure supported clustering solutions
 - Create a cluster design based on
 - Physical vs. virtual nodes
 - Physical to virtual
 - Virtual to virtual
 - Consideration of VMware HA and DRS cluster requirements
 - BUS sharing modes
 - Virtual
 - Physical
 - RDM types
 - passthru
 - non-passthru
 - heartbeat network vs. public network
 - cluster resource sets
 - Applications
 - Disks

- Networks
- Network shares
- Verify adequate resource allocation through testing
- Convert a physical machine to a virtual machine
 - Remove physical devices
 - Hidden devices
 - Drivers
 - Disk resizing
- Convert a virtual machine to a ESX Server virtual machine

Tools

- VMware Tools
- VMware Converter
- VI Client
- Web Access Client
- Command line Terminal Services Utilities
 - tscon

Objective 6.2 – Manage application and Virtual Machine Operations.

Knowledge

- Explain snapshots vs. independent disks

Skills and Abilities

- Monitor Virtual Machines status
- Monitor application availability
- Use VCB CLI commands to backup virtual machines
 - Full VM
 - File Level
- Use VMware Converter to restore Full VM backups

Decisions

- Determine when to use snapshots vs. independent disks
- Determine when to use specific VCB restore mechanisms
 - Centralized restore
 - Group restore
 - Redirected restore (“self-service restore”)

Tools

- VCB
- VMware Tools