VMware Design Exam Blueprint

Section 1 – Availability

Objective 1.1 – Analyze and define security requirements for Business Continuity and Disaster Recovery virtual infrastructure design.

Knowledge
• Identify the impact of internal/regulatory compliance requirements on a BC/DR VI3 design
• Explain the backup process including which personnel have access to media
  o Identify security options for backup media
    • Location
    • Encryption
    • Transportation
    • Storage
    • Security domains influencing BC/DR
      • Confidentiality
      • Availability
      • Integrity
• Identify third party technologies influencing security components of the BC/DR solution
• Describe how extending BC/DR impacts security
• Explain the impact of integrating BC/DR into existing security domains

Skills and Abilities
• Given a set of internal and regulatory requirements, create an architectural design based on interpretations of these requirements
  o Examples include:
    • Government
    • Finance
    • Health care
    • Education
    • Privacy
• Recommend modifications to security policies for virtual infrastructure integration

Tools
• Customer’s existing security policy binder

Objective 1.2 – Analyze and define storage requirements for Business Continuity and Disaster Recovery virtual infrastructure design.

Knowledge
• Explain how geography impacts storage design decisions
  o Proximity
  o Bandwidth
  o Latency
  o Disaster likelihood
• Compare and contrast storage replication technologies
  o Pre-requisites
  o Features
  o Cost
• Identify ways to detect and prevent disasters based on log information
  o RAID set
  o IO errors
• Identify storage fault tolerance capabilities
  o VMware
  o Storage vendors
• Compare tradeoffs of performance and availability based on storage features
• Plan virtual disk placement based on backup/replication needs

Skills and Abilities
• Identify current customer implementation of BC/DR storage technologies and processes
• Create a DR storage design based on
  o Storage technologies
    ▪ Replication
      ▪ Distance
      ▪ Local
    ▪ Clustering
    ▪ Vendor
  o Locations
  o Customer business requirements
  o Environmental constraints
• Map storage-based business continuity requirements to disaster recovery solution

Decisions
• Recommend appropriate storage vendor solutions
• Decide the bandwidth and topology including latency to meet storage requirements
• Determine appropriate server placement options based on storage requirements

Tools
• Diagram tools
• Word processing tools
• Spreadsheet tools

Objective 1.3 – Analyze and define server and platform (hardware components) requirements for Business Continuity and Disaster Recovery virtual infrastructure design.

Knowledge
• Explain how geography impacts server/platform design decisions
  o Proximity
  o Bandwidth
  o Latency
  o Disaster likelihood
• Compare and contrast DR site server requirements with primary site requirements
• Compare and contrast clustering technologies in virtual machines
  o Cluster in a box
  o N+1 cluster
  o Cluster across boxes
  o Third party clustering solutions on the VMware HCL
• Identify early warning flags for impending failures
  o Log entries
• Identify server hardware fault tolerance capabilities
  o Power supplies
  o Cards
  o Memory
• Compare tradeoffs of performance and availability based on server hardware and resource constraints

Skills and Abilities
• Identify current customer implementation of BC/DR server technologies and processes
• Determine HA configuration design requirements
• Analyze logs to predict and prevent hardware failure scenarios
• Create a DR server design based on
  o Business constraints
  o Technical constraints
  o Geographic constraints
  o Environmental constraints
• Map server-based business continuity requirements to disaster recovery solution
• Determine VMware compatible monitoring agents

Decisions
• Recommend appropriate server solutions
• Decide the bandwidth and topology including latency to meet design requirements
• Determine appropriate server placement options based on availability requirements
• Recommend appropriate hardware monitoring methodology

Tools
• Diagram tools
• Word processing tools
• Spreadsheet tools
• Vendor and VMware HCL
Objective 1.4 – Analyze and define network requirements for Business Continuity and Disaster Recovery virtual infrastructure design.

Knowledge

- Explain how geography impacts network design decisions
  - Proximity
  - Bandwidth
  - Latency
  - Disaster likelihood
  - Cost
  - Availability
- Compare and contrast network technologies
  - Pre-requisites
  - Features
  - Cost
- Identify ways to detect and prevent link failures/network interruptions based on server and hardware log information
- Identify network fault tolerance capabilities
  - VMware
  - Network vendors
- Compare tradeoffs of performance and availability based on network features

Skills and Abilities

- Identify current customer implementation of BC/DR network technologies and processes
- Create a DR networking design based on
  - Network technologies
    - Topology
      - VLAN
      - LAN/WAN
      - Media
      - Protocols
      - Routing
    - Vendor
      - Locations
      - Customer business requirements
      - Environmental constraints
- Map network based business continuity requirements to disaster recovery solution
- Demonstrate understanding of replication technology

Decisions

- Recommend appropriate network vendor solutions
- Decide the bandwidth and topology including latency to meet network requirements
- Determine appropriate server placement options based on network requirements

Tools

- Diagram tools
- Word processing tools
- Spreadsheet tools
Objective 1.5 – Analyze and define application and VM requirements for Business Continuity/Disaster Recovery virtual infrastructure design.

Knowledge

- Compare and contrast clustering technologies
- Determine clustering methodology requirements and its impact on the design
- Explain clustering and application technologies and their fit in a virtual infrastructure
  - Virtual infrastructure limits
  - Application requirements
  - Cluster aware applications
- Identify how business requirements influence application deployment
  - Service level agreements (SLA’s)
- Compare and contrast physical vs. virtual nodes characteristics and best fit
- Present the benefits of using VMware for BC/DR applications

Skills and Abilities

- Explain clustering technologies and its fit in a virtual infrastructure
- Create a cluster design based on
  - Physical vs. virtual nodes
    - Physical to virtual
    - Virtual to virtual
  - BUS sharing modes
    - Virtual
    - Physical
  - RDM types
    - Passthrough
    - Non-passthrough
  - Heartbeat network vs. public network
  - Cluster resource sets
    - Applications
    - Disks
    - Networks
    - Network shares
- Recommend appropriate backup solutions based on business requirements
  - VCB
  - Guest based
    - LUN replication via layered applications
- Identify the integration components of VCB with third party backup solutions

Decisions

- Decide appropriate application/VM deployment options
  - Heterogeneous
- Decide which level of support applies to each application based on business or operational requirements
- Determine clustering methodology requirements and its impact on the design
- Determine HA configuration for the VM
- Recommend appropriate backup solutions for VMs
  - VCB
  - Guest based
  - LUN replication via layered applications

**Tools**
- Diagram tools
- Word processing tools
- Spreadsheet tools

**Objective 1.6 – Analyze and define operational and management requirements for Business Continuity and Disaster Recovery virtual infrastructure design.**

**Knowledge**
- Identify the skills needed in a disaster recovery team
- Identify team roles to participate in disaster recovery situations
- Explain the difference between business continuity and disaster recovery
  - Business continuity = strategic
  - Disaster recovery = tactical
- Explain the DR capabilities of the virtual infrastructure

**Skills and Abilities**
- Translate a business continuity plan into an architectural design
  - Staffing
  - Finances
  - Service Level Agreements
    - Segmentation
    - Prioritization
    - Recovery Time Objectives (RTO)
    - Recovery Point Objectives (RPO)
  - Interview various project stakeholders to ensure Service Level Agreements (SLA) maps successfully to business processes and proposed architecture
- Develop a test plan that verifies the DR Service Level Agreements (SLA) are met

**Decisions**
- Determine mismatches between business requirements and infrastructure capabilities
- Determine go/no go decision
  - Testing phase
  - Production phase
Tools
- Workflow diagram
- IT Organization chart

Section 2 – Scalability

Objective 2.1 – Analyze and define security requirements for the virtual infrastructure design.

Knowledge
- Identify individual security levels and roles
- Identify physical security constraints
  - Location
  - Access
    - Local
    - Remote
- Identify storage security requirements
  - LUN security
  - SAN infrastructure
- Identify anti-virus suitability
- Define security patch management
- Identify events types for monitoring security
- Identify intrusion prevention techniques
  - Firewall
  - Ports
  - Services
  - ACS (access control system)
- Identify network security requirements
  - VLANs
  - Physical switch separation
  - Virtual switch settings
  - Implementing network segregation

Skills and Abilities
- Define how to generate and implement SSL certificate
  - Defaults
  - Encryption level
- Select the appropriate authentication technology
  - Active directory
  - NIS
  - LDAP
  - Local
- Recommend appropriate LUN security methodologies
  - Masking
  - Zoning
  - Storage processor specific security
• Explain the options for deploying Anti-virus protection
• Explain VI3 specific security events and traps

**Decisions**

• Decide how to group servers for LUN security
• Decide how to group servers for physical access
• Decide what type remote access is used
• Define groups’ and roles’ permissions
• Define the security settings based on regulatory compliance

**Tools**

• VI Client
• esxupdate

**Objective 2.2 – Analyze and define storage capacity requirements for the virtual infrastructure design.**

**Knowledge**

• Identify storage options
  o Storage medium
    ▪ Fibre
    ▪ iSCSI
    ▪ NAS
    ▪ Direct-Attached
  o Private vs. Shared
  o RAID level
  o Storage cache characteristics
  o LUN sizing
    ▪ Spindle alignment
• Identify the design ramifications for
  o Virtual disk sizing
  o Virtual disk provisioning types
    ▪ Thin
    ▪ Thick
  o Swap files
    ▪ Kernel swap
    ▪ Guest OS swap
    ▪ Virtual machine swap
  o VM snapshots
    ▪ VCB snapshots
    ▪ Rollback
• Understand storage resource requirements needed to support the Virtual Infrastructure
• Understand VirtualCenter resource and performance information
• Understand output from VMware and/or third party capacity planning tools
• Assess storage vendors to best meet business need
  o Storage arrays
  o HBA’s
Skills and Abilities
- Identify and recommend benchmarking tools and create test plans
- Design SAN infrastructure including zoning and masking
- Design partitioning based on security, performance and HA
- Justify storage design choices
- Measure disk space and storage bandwidth consumption
- Interpret VirtualCenter trending on disk-space utilization
- Interpret Capacity Planner (or equivalent) output to determine required storage capacity for a virtual infrastructure
- Interpret and analyze capacity monitoring results and determine business impact and appropriate response
- Forecast storage capacity requirements
- Identify appropriate statistical gathering tools

Decisions
- Determine how to deploy LUNs
- Given a set of requirements, determine the appropriate storage choices
- Given a set of requirements, select the vendors to best meet business needs and architecture needs
- Given a set of requirements, design zoning and masking architecture
- Decide when new resources will be required
- Decide how much new resources will be required
- Define procurement schedule based on VirtualCenter trending details

Tools
- Vendor benchmarking tools
- Comparative matrix
- VMware HCL
- Microsoft disk management tools
- Linux commands: du, df
- Capacity Planning Tools
  - VMware Capacity Planner
  - Third-party tools (i.e. PlateSpin, Vizioncore, etc.)

Objective 2.3 – Analyze and define network capacity requirements for the virtual infrastructure design.

Knowledge
- Identify virtual network capabilities and requirements
- Differentiate between different media types
  - Performance
Suitability

- Differentiate topology characteristics
  - LAN
  - WAN
- Interpret results of statistical gathering tools
- Understand network load-balancing techniques
- Understand network resource requirements needed to support the Virtual Infrastructure
- Understand VirtualCenter resource and performance information
- Understand output from VMware and/or third party capacity planning tools

Skills and Abilities

- Evaluate network vendors and capabilities to best meet business need
  - NICs
  - Switches
  - Routers
  - VLAN and trunking
- Design network configuration
  - Separate management network from general access network
  - Virtual Network configuration
- Identify appropriate statistical gathering tools
- Interpret network bandwidth consumption statistics
- Interpret Capacity Planner (or equivalent) output to determine required network capacity for a virtual infrastructure

Decisions

- Given a set of requirements, recommend the appropriate network architectural design including
  - Network security
    - Firewall/ports
    - VLAN
  - Configuration
    - Routing
    - Protocols
    - Load balancing
    - Fault tolerance
    - Capacity
- Decide when new resources will be required
- Decide how much new resources will be required
- Define procurement schedule based on VirtualCenter trending details

Tools

- Visio or other graphical design tool
- Router and switch load reports
- Packet-sniffing tools
- VirtualCenter network statistics reports
- ESX Server traffic shaping
Objective 2.4 – Analyze and define CPU and memory capacity-planning requirements for the virtual infrastructure design.

Knowledge

- Understand how to determine CPU and memory resource contention using available metrics
  - %READY
  - CPU queue depth
  - Ballooning
  - Swap Activity
- Understand CPU and memory resource requirements needed to support the Virtual Infrastructure
- Identify design characteristics that require specific Resource Pool configurations including
  - Reservations
  - Limits
  - Shares
- Understand VirtualCenter resource and performance information
- Understand output from VMware and/or third party capacity planning tools

Skills and Abilities

- Interpret VirtualCenter trending on CPU and memory utilization
- Interpret Capacity Planner (or equivalent) output to determine required CPU and memory capacity for a virtual infrastructure
- Configure Resource Pools and DRS to balance resource utilization to meet currently available capacity
- Analyze appropriate logs and configuration parameters for the ESX servers

Decisions

- Decide when new resources will be required
- Decide how much new resources will be required
- Define procurement schedule based on VirtualCenter trending details

Tools

- Capacity Planning Tools
  - VMware Capacity Planner
  - PlateSpin XXX
  - Vizioncore
- VMware VirtualCenter
- Unix/Linux SAR tool
- Microsoft Perfmon
Section 3 – Manageability

Objective 3.1 – Apply business needs to virtual infrastructure and traditional management components.

Knowledge
- Explain integration of virtual infrastructure components with traditional datacenter and management components.
  - Server based
    - Monitoring/Management server
      - SNMP server
    - Deployment server
    - Centralized logging server
    - IDS and other security server systems
    - DNS
    - Time server
    - Asset management
    - Database server
    - Licensing
      - Applications
      - Guest OS
  - Software based
    - Daemon/service
    - Agents
    - Directory services

Skills and Abilities
- Specify integration requirements for OEM-supplied management tools
- Identify virtual infrastructure and hardware fit in a management platform
  - Plug-ins
  - Agents
  - Customization
- Document how the virtual infrastructure and hardware fit in a management platform
- Conduct gap analysis between management platform and supported within the virtual infrastructure
  - Recommend workarounds
  - Redesign architecture

Decisions
- Decide how to document the integration
- Recommend how to engage related third party vendors
- Decide on integration plan and develop test plans

Tools
- Diagram tools
- Word processing tools
- Supporting documentation
Objective 3.2 – Operational Readiness

Knowledge
• Explain fundamental responsibilities of service support and service delivery personnel.
  o Service support
    ▪ Incident management
    ▪ Problem management
    ▪ Change management
    ▪ Release management
    ▪ Configuration management
  o Service delivery
    ▪ Availability management
    ▪ Capacity management
    ▪ Financial management for IT services
    ▪ Service continuity plan
    ▪ Service quality plan
• Identify the skills needed to manage a virtual infrastructure
• Identify the potential roles used to manage a virtual infrastructure

Skills and Abilities
• Interpret the output of an operational readiness assessment
• Analyze the project schedule and ensure accurate resource requirements
• Perform a gap analysis between operational readiness assessment results and the design of virtual infrastructure
  o Sufficient staff
  o Training needs
  o Knowledge transfer
  o Documentation
  o Risks of not following recommendations
  o Correlate risks to financial implications
  o Other financial considerations

Decisions
• Recommend staffing options to provide service support and service delivery which align with the architectural design requirements
• Generate a gap analysis for staffing requirements based on service methodologies
  o Service support
    ▪ Incident management
    ▪ Problem management
    ▪ Change management
    ▪ Release management
    ▪ Configuration management
  o Service delivery
    ▪ Availability management
    ▪ Capacity management
    ▪ Financial management for IT services
    ▪ Service continuity plan
    ▪ Service quality plan
Objective 3.3 – Contingency Planning

Knowledge

- Identify common challenges for managing a virtual infrastructure
  - Systems maintenance
  - Patch and release management
  - Backup and Restores
  - Testing
- Identify and communicate best practices for implementing the design

Skills and Abilities

- Incorporate risk mitigation considerations into a design
  - Preventative maintenance
  - Patch update
  - Back up and restores

Decisions

- Determine what defines a production vs. non-production system(s)
- Determine the appropriate reactions to virtual infrastructure events
  - Loss of server
  - Deletion or corruption of virtual machine
  - Loss of major component within virtual infrastructure
  - Gather forensic evidence for root cause analysis
- Determine which reactions are required optional based on situation

Tools

- Supporting documentation
  - White papers
  - Knowledge base
  - Trends
  - Knowledge base

Objective 3.4 – Operations and management design requirements.

Knowledge

- Identify standard processes for education and documenting designs
- Identify organizational hierarchy of the customer team
- Identify other vendors involved in the process
- Describe TCO and ROI formulae
- Identify existing name conventions and the impact of naming conventions on the design

Skills and Abilities

- Recommend members for VI decision making team
- Educate VI team members and executives on operations and management
• Document the design, process and workflows
  o Charge back models
  o TCO
  o ROI
  o Capacity utilization
    ▪ Requirements
    ▪ Forecasts
    ▪ Placements
  o Storage layout
  o Network layout
• Fit the design to the existing naming conventions and/or recommend appropriate naming conventions
  o ESX server
  o VI component names
    ▪ Datastores
    ▪ Virtual port groups
    ▪ Resource pools
    ▪ Folders
    ▪ Alarm definitions
    ▪ Datacenters
    ▪ Roles
    ▪ Virtual machines
    ▪ Virtual disks
  o Physical infrastructure
    ▪ LUN
    ▪ Storage group
    ▪ VLAN
    ▪ Zones

Decisions
• Oversee the implementation of the test plan

Tools
• Diagram tools
• Word processing tools
• Spreadsheet tools
• Presentation tools
Section 4 – Sizing

Objective 4.1 – Size Virtual Machines in a VMware Infrastructure

Knowledge
- Identify maximum possible resource allocations for virtual machines on a given platform
  - CPU/SMP
  - RAM
  - Disk IO
  - Network IO
- Explain how to properly distribute loads

Skills and Abilities
- Determine application allocation across virtual infrastructure
  - Load balancing
  - Application separation
    - Security
    - Fault tolerance
- Analyze metrics
- Analyze performance log
- Interpret virtualization assessment reports
  - Disk IO
  - Network IO
  - CPU utilization
  - RAM
  - Physical device access requirements

Decisions
- Given a set of requirements, decide where to place applications based on:
  - Hosts
  - Resource pools
  - Clusters
  - Data centers
  - Storage
  - Network
- Define and design the test plan

Tools
- Virtualization assessment reports
  - Knowledge base
Objective 4.2 – Define Application/VM design requirements for a virtual infrastructure.

Knowledge

- Identify design requirements for specific application solutions
  - Microsoft Exchange
  - Microsoft SQL
  - Microsoft Active Directory
- Explain the process for determining application suitability
- Identify design requirements for specific VM solutions
  - VDI/VDM
  - Remote/Branch Office
- Identify application resource requirements for virtual machines
  - CPU
  - Memory
  - Disk IO
  - Network IO

Skills and Abilities

- Identify application’s suitability for virtualization
- Classify application resource requirements
- Analyze existing logs for issues that could impact virtualization

Tools

- Tech Notes
- Whitepapers
- Application-specific sizing estimators