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
    - 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
    - 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
    - Proximity
    - Bandwidth
    - Latency
    - Disaster likelihood

- Compare and contrast storage replication technologies
    - Pre-requisites
    - Features
    - Cost
- Identify ways to detect and prevent disasters based on log information
    - RAID set
    - IO errors
- Identify storage fault tolerance capabilities
    - VMware
    - Storage vendors
- Compare tradeoffs of performance and availability based on storage features
- Plan virtual disk placement based on backup/replication needs

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

<u>Decisions</u>
- 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

<u>Tools</u>
- 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.

<u>Knowledge</u>
- Explain how geography impacts server/platform design decisions
    - Proximity
    - Bandwidth
    - Latency
    - Disaster likelihood

- Compare and contrast DR site server requirements with primary site requirements
- Compare and contrast clustering technologies in virtual machines
    - Cluster in a box
    - N+1 cluster
    - Cluster across boxes
    - Third party clustering solutions on the VMware HCL
- Identify early warning flags for impending failures
    - Log entries
- Identify server hardware fault tolerance capabilities
    - Power supplies
    - Cards
    - 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
    - Business constraints
    - Technical constraints
    - Geographic constraints
    - 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

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- 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 recover = 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

<u>Decisions</u>
- 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

<u>Tools</u>
- VI Client
- `esxupdate`

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

<u>Knowledge</u>
- Identify storage options
  - Storage medium
    - Fibre
    - iSCSI
    - NAS
    - Direct-Attached
  - Private vs. Shared
  - RAID level
  - Storage cache characteristics
  - LUN sizing
    - Spindle alignment
- Identify the design ramifications for
  - Virtual disk sizing
  - Virtual disk provisioning types
    - Thin
    - Thick
  - Swap files
    - Kernel swap
    - Guest OS swap
    - Virtual machine swap
  - 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
  - Storage arrays
  - HBA's

- o FC switches
- Identify zoning and masking requirements
- Interpret logs and configuration parameters for the ESX servers
- Interpret results of statistical gathering tools

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
  - o VMware Capacity Planner
  - o 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
  - o Performance

- o Suitability
- Differentiate topology characteristics
  - o LAN
  - o 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

<u>Skills and Abilities</u>
- Evaluate network vendors and capabilities to best meet business need
  - o NICs
  - o Switches
  - o Routers
  - o VLAN and trunking
- Design network configuration
  - o Separate management network from general access network
  - o 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

<u>Decisions</u>
- Given a set of requirements, recommend the appropriate network architectural design including
  - o Network security
    - Firewall/ports
    - VLAN
  - o 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

<u>Tools</u>
- 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.
    - o 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
    - o 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
    - o Plug-ins
    - o Agents
    - o 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
    - o Recommend workarounds
    - o 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.
  - Service support
    - Incident management
    - Problem management
    - Change management
    - Release management
    - Configuration management
  - 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
  - Sufficient staff
  - Training needs
  - Knowledge transfer
  - Documentation
  - Risks of not following recommendations
  - Correlate risks to financial implications
  - 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
  - Service support
    - Incident management
    - Problem management
    - Change management
    - Release management
    - Configuration management
  - Service delivery
    - Availability management
    - Capacity management
    - Financial management for IT services
    - Service continuity plan
    - Service qualify 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
  - Charge back models
  - TCO
  - ROI
  - Capacity utilization
    - Requirements
    - Forecasts
    - Placements
  - Storage layout
  - Network layout
- Fit the design to the existing naming conventions and/or recommend appropriate naming conventions
  - ESX server
  - VI component names
    - Datastores
    - Virtual port groups
    - Resource pools
    - Folders
    - Alarm definitions
    - Datacenters
    - Roles
    - Virtual machines
    - Virtual disks
  - 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.

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

<u>Skills and Abilities</u>

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

<u>Tools</u>
- Tech Notes
- Whitepapers
- Application-specific sizing estimators