CompTIA Cloud+

Course Contents

1.0 Cloud Concepts and Models

1.1 Compare and contrast cloud services.

* SaaS (according to NIST)
* IaaS (according to NIST)
* CaaS (according to NIST)
* PaaS (according to NIST)
* XaaS (according to NIST)
* DaaS (according to NIST)
* BPaaS
* Accountability and responsibility based on service models

1.2 Compare and contrast cloud delivery models and services.

* Private
* Public
* Hybrid
* Community
* On-premise vs. Off-premise hosting
* Accountability and responsibility based on delivery models
* Security differences between models
    - o Multitenancy issues
    - o Data segregation
    - o Network isolation
    - o Check laws and regulations

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* Functionality and performance validation based on chosen delivery model

* Orchestration platforms

1.3 Summarize cloud characteristics and terms.

* Elasticity

* On-demand self serve/just in time service

* Pay-as-you-grow

* Chargeback

* Ubiquitous access

* Metering resource pooling

* Multitenancy

* Cloud bursting

* Rapid deployment

* Automation

1.4 Explain object storage concepts.

* Object ID

* Metadata

* Data/blob

* Extended metadata

* Policies

* Replicas

* Access control

2.0 Virtualization

2.1 Explain the differences between hypervisor types.

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* Type I and Type II
    - o Bare metal vs. OS dependant
    - o Performance and overhead considerations
    - o Hypervisor specific system requirements
* Proprietary vs. open source
* Consumer vs. enterprise use
    - o Workstation vs. infrastructure

2.2 Install, configure, and manage virtual machines and devices.

* Creating, importing, and exporting template and virtual machines
* Install guest tools
    - o Drives
    - o Management tools
* Snapshots and cloning
* Image backups vs. file backups
* Virtual NIC
    - o Virtual network
    - o IP address
    - o Default gateway
    - o Netmask
    - o Bridging
* Virtual disks
    - o Limits
    - o SCSI/ATA ID

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* Virtual switches
    - o VLAN
    - o Interface configuration
* VLAN
    - o Assign IDs
    - o Bind interfaces
* VSAN
    - o Assign IDs

2.3 Given a scenario, perform virtual resource migration.

* Establish requirements
* Maintenance scheduling
* Reasons
    - o Performance issues
    - o Testing
    - o Upgrading
    - o Utilization
* Storage migration
    - o Virtual vs. physical
* Online vs. offline migrations
* Physical to Virtual (P2V)
* Virtual to Virtual (V2V)
* Virtual to Physical (V2P)

2.4 Explain the benefits of virtualization in a cloud environment.

* Shared resources
* Elasticity
    - o Time to service/mean time to implement
    - o Resource pooling
    - o Scalable
    - o Available
    - o Portable
* Network and application isolation
* Infrastructure consolidation
* Virtual datacenter creation

2.5 Compare and contrast virtual components used to construct a cloud environment.

* Virtual network components
    - o Virtual NIC
    - o Virtual HBA
    - o Virtual router
* Shared memory
* Virtual CPU
* Storage Virtualization
    - o Shared storage
    - o Clustered storage
    - o NPIV

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3.0 Infrastructure

3.1 Compare and contrast various storage technologies.

* Network Attached Storage (NAS)
    - o File level access
    - o Shared storage
* Direct Attached Storage (DAS)
    - o Block level access
    - o Dedicated storage
* Storage Area Network (SAN)
    - o Block level access
    - o Shared storage
    - o HBAs
    - o LUN masking
    - o Zoning
    - o WWN
    - o Fiber channel protocols
* Different access protocols
    - o FCoE
    - o FC
    - o Ethernet
    - o iSCSI
* Protocols and applications
    - o IP

- o FCP
- o iSCSI

* Management differences

3.2 Explain storage configuration concepts.

* Disk types
  - o SSD vs. spinning
  - o Interfaces types
  - o Access speed
* Tiering
  - o Performance levels of each tier
  - o Policies
* RAID levels
  - o RAID 1
  - o RAID 0
  - o RAID 1+0
  - o RAID 0+1
  - o RAID 5
  - o RAID 6
* File system types
  - o UFS
  - o EXT
  - o NTFS
  - o FAT

- o VMFS
- o ZFS

3.3 Execute storage provisioning.

- * Creating LUNs
- * Creating network shares
- * Zoning and LUN masking
- * Multipathing
- * Implications of adding capacity to a NAS and SAN
  - o Impact to operations
  - o Downtime
  - o Best practices

3.4 Given a scenario, implement appropriate network configurations.

- * NAT
- * PAT
- * Subnetting/Supernetting
- * VLAN and VLAN tagging
- * Network port configurations
- * Switching and routing in physical and virtual environments
  - o Routing tables

3.5 Explain the importance of network optimization.

- * WAN
- * LAN
- * MAN

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* Bandwidth
* Latency
* Compression
* Caching
* Load balancing
* Devices on the same subnet

3.6 Given a scenario, troubleshoot basic network connectivity issues.

* Tools
    - o ping
    - o tracert/traceroute
    - o telnet
    - o netstat
    - o nslookup/dig
    - o ipconfig/ifconfig
    - o route
    - o arp
* Review documentation and device configuration settings
* Review system logs

3.7 Explain common network protocols, ports, and topologies.

* Trunk ports
* Port binding/aggregation
* Common ports
    - o 80

- 21
- 22
- 25
- 53
- 443
- 68

* Common protocols
  - HTTP
  - FTP
  - HTTPS
  - FTPS
  - SFTP
  - SSH
  - DNS
  - DHCP
  - SMTP
* Types of networks
  - intranet
  - extranet
  - internet

3.8 Explain common hardware resources and features used to enable virtual environments.

* BIOS/firmware configurations
* Minimum memory capacity and configuration

* Number of CPUs
* Number of Cores
* NICs quantity, speeds, and configurations
* Internal hardware compatibility
* HBAs
* Storage media
    - o Tape
    - o SSD
    - o USB
    - o Disk

4.0 Network Management

4.1 Given a scenario, implement and use proper resource monitoring techniques.

* Protocols
    - o SNMP
    - o WMI
    - o IPMI
    - o Syslog service
* Alert methods
    - o SMTP
    - o SMS
    - o SNMP
    - o Web services
    - o Syslog

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* Establish baselines and thresholds

* Automated responses to specific events

* Examine processes usage / resource usage

4.2 Given a scenario, appropriately allocate physical (host) resources using best practices.

* Memory

* CPU

* Storage and network allocation

* Entitlement/quotas (shares)

    o Hard limit

    o Soft limit

* Reservations

* Licensing

* Resource pooling

4.3 Given a scenario, appropriately allocate virtual (guest) resources using best practices.

* Virtual CPU

* Memory

* Storage and network allocation

* Entitlement/quotas (shares)

* Hard limit, soft limit

* Reservations, licensing

* Dynamic resource allocation

* Resource pooling

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* CPU affinity
* Physical resource redirection and mapping to virtual resources
    - o Serial
    - o USB
    - o Parallel port mapping

4.4 Given a scenario, use appropriate tools for remote access.

* Remote hypervisor access
* RDP
* SSH
* Console port
* HTTP

5.0 Security

5.1 Explain network security concepts, tools, and best practices.

* ACLs
* VPNs
* IDS/IPS hardware/software-based firewalls
* DMZ
* Review / audit logs
* Attacks
    - o DDoS
    - o Ping of death
    - o Ping flood

5.2 Explain storage security concepts, methods, and best practices.

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* Obfuscation
* Access Control Lists
* Zoning
* LUN masking
* User and host authentication
* Review/audit logs

5.3 Compare contrast different encryption technologies and methods.

* PKI
* IPSEC
* SSL/TLS
* Ciphers
    - o AES
    - o 3DES
    - o RSA
    - o DSA
    - o RC4
    - o RC5
* Encryption for data in transit and encryption for data at rest

5.4 Identify access control methods.

* Role-based administration
* Mandatory access controls
* Discretionary access controls
* Multifactor authentication

* Single sign-on

* Federation

5.5 Implement guest and host hardening techniques.

* Disabling unneeded ports and services

* User credentials

    o Changing default passwords

* Host-based/software firewalls

* Antivirus software

* Patching

* Deactivating default accounts

6.0 Systems Management

6.1 Explain policies and procedures as they relate to a cloud environment.

* Network and IP planning/documentation

* Configuration standardization and documentation

* Change management best practices

    o Documentation

    o Configuration control

    o Asset accountability

    o Approval process

    o Back-out plan

* Configuration management

    o CMDB

    o Approval process
    o Configuration control

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* Capacity management
    - o Monitoring for changes
    - o Trending
* Systems life cycle management
* Maintenance windows
    - o Server upgrades and patches

6.2 Given a scenario, diagnose, remediate and optimize physical host performance.

* Disk performance
* Disk tuning
* Disk latency
* Swap disk space
* I/O tuning
* Performance management and monitoring tools
* Establish baseline and create documentation with appropriate tools
* Hypervisor configuration best practices
    - o Memory ballooning
    - o I/O throttling
    - o CPU wait time
* Impact of configuration changes to the virtual environment
* Common issues
    - o Disk failure
    - o HBA failure
    - o Memory failure

- o NIC failure
- o CPU failure

6.3 Explain common performance concepts as they relate to the host and the guest.

* IOPS
* Read vs. write files
* File system performance
* Metadata performance
* Caching
* Bandwidth
* Throughput (bonding/teaming)
* Jumbo frames
* Network latency
* Hop counts
* QoS
* Multpathing
* Load balancing
* Scaling
  - o Vertical vs. horizontal vs. diagonal

6.4 Implement appropriate testing techniques when deploying cloud services.

* Test replication
* Test latency
* Test bandwidth
* Test load balancing

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* Test application servers
* Test storage
* Test application delivery
* Service performance testing and application performance testing
* Penetration testing
* Vulnerability assessment
* Separation of duties during testing

7.0 Business Continuity in the Cloud

7.1 Compare and contrast disaster recovery methods and concepts.

* Redundancy
* Failover
* Geographical diversity
* Failback
* Replication
* Site mirroring
* Hot site
* Cold site
* Warm site
* Backup and recovery
* Archiving and offsite storage
* Replication types
    - o Synchronous
    - o Asynchronous

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* RTO
* RPO
* MTBF
* MTTR
* Mission critical requirements

7.2 Deploy solutions to meet availability requirements.

* Fault tolerance
    - o High availability
    - o Local clustering /geoclustering
    - o Non-high availability resources
* Multipathing
* Load balancing