

# Episode 2.01

Deployment Exam Objectives Explained

# Quick Review

- Objective 1.1 is about ensuring appropriate requirements are matched to cloud features
- Objective 1.2 is about executing a deployment plan
- Objective 1.3 is about evaluating a testing plan to ensure it helps to meet requirements
- Objective 1.4 is about evaluating the results of a testing plan to determine if the test was successful

# **Episode 2.02**

**Cloud Component Interaction, Part 1**

# Network Components

- Routing and switching
  - Local
    - Network has physical routers and switches
  - Online
    - Ex: AWS Virtual Private Cloud (VPC) subnets communicate with a “route”
    - Network is virtualized
  - Network configuration based on requirements

# Network Components

- Load balancing
  - Distribute traffic load among multiple servers
- DHCP (Dynamic Host Configuration Protocol)
  - Gives IP address to a network device
  - Each virtual machine instance needs an IP address
- DNS (Domain Name System)
  - Resolve domain names to IP addresses
  - May be required in your cloud deployment

# Network Components

- NTP (Network Time Protocol)
  - Synchronize clocks across all devices
  - Used with authentication
  - Used with activity logging
- VPNs (Virtual Private Networks)
  - Secure traffic through the network (local or cloud)

# **Application Components**

- Databases
  - Analysis
  - Data warehouse
  - Data lake
  - Big data
- Web servers
  - What do they need access to?
- E-mail
  - Self hosted or cloud hosted?
- User applications
  - What do they need in the cloud?

# Quick Review

- Even in the cloud, routing and switching play an important role from IP configuration to virtual interface filtering
- Virtual Private Networks (VPNs) can be used to secure connectivity between cloud components
- All major cloud providers offer database-in-the-cloud functionality for analysis, big data, data warehousing and more

# **Episode 2.03**

## **Cloud Component Interaction, Part 2**

# Storage Components

- Drive selection
  - Hard disks
    - Cheaper
    - Don't perform as well
  - SSD (solid-state drive)
    - More expensive
    - Better performance
    - Better for high IOPS  
(input/output operations per second)

# Storage Components

- Drive selection
  - Hard disks
    - Cheaper
    - Don't perform as well
    - Better for lots of storage and low demand on speed
  - SSD (solid-state drive)
    - More expensive
    - Better performance
    - Better for high IOPS (input/output operations per second)

# Storage Components

- Storage type
  - Block
    - Read/write to the disk
  - File/object
    - Used with most cloud storage
    - Have a place to stick a file
  - Data
    - Databases

# Storage Components

- Public storage
  - Anyone can access
- Private storage
  - Internal access

# Compute Components

- Virtual servers
  - Put Windows/Linux/etc server up in the cloud
- Virtual platforms
  - Server running a set of runtime environments to run applications

# Compute Components

- Serverless processing
  - Code that runs *somewhere* in the cloud
- RAM
  - Enough memory to get the job done
- CPU
  - Processing power to keep up with the workload
- Special processors
  - Graphics processors

# Security Components

- Authentication
  - Validate identity of a user/device
- Authorization
  - Authenticated user/device can do what they're trying to do
- Accounting
  - Logging activity
- Integrity
  - Data is maintained in a consistent state
- Confidentiality
  - Only people who are supposed to access can access

# Quick Review

- Most cloud service providers offer either SSD or Hard Disks and SSD is faster
- Block-level storage access is access similar to local hard drives in a computer
- Virtual servers run in the cloud and act as physical servers on a network
- Cloud security should include authentication, authorization, accounting, integrity and confidentiality

# Episode 2.04

## Non-Cloud Component Interaction

# Network Components

- Direct connection
  - Establish direct connection with cloud provider
  - Special leased lines
  - Expensive
- VPN connection
  - Create a tunnel
  - Encrypt data to make a Virtual Private Network (VPN)
  - A tunnel is NOT a VPN!

# Network Components

- Specialized gateways
  - Offered by service provider
- Open Internet connection
  - Preferably with HTTPS
    - Uses encryption (more secure)

# Application Components

- Where does the application run?
  - In the cloud
  - Locally
  - Both
- Where is the data?
  - In the cloud
  - Local
  - Both

# Storage Components

- Internet-based
  - Transfer via the Internet using encryption
  - Can take a LONG time with large amounts of data
- Offline archive shipment
  - Data storage device is sent to you, you copy your data, then send it back
- Mobile data transfer
  - Most expensive
  - Storage data center shipped to you via semi truck

# Storage Components

- Will the cloud servers need access to permanent local data?
  - Do cloud servers need to access data that stays in your local network?
  - Encryption
  - Protocols

# Security Components

- Use security components to connect between local and cloud
- Authenticate cloud server
- Authorize cloud server
- Account/log activities
- Integrity in the processing
- Data remains confidential through the network

# Quick Review

- VPN connections are often used between your local network and the cloud network
- Application can be multi-tier with some portions running locally and some running in the cloud
- Some cloud providers allow you to ship large volumes of data to them on storage media and then have it imported into your cloud account storage

# **Episode 2.05**

## **Platforms and Applications**

# Understanding Platforms

- Platforms provide a foundation on which to build and deploy applications
  - Old way: build everything from scratch
  - Modern way: create a good platform with everything you need for an application
- Considerations:
  - Operating systems
  - Runtime environments
  - Interpreters
  - Web frameworks
  - Application frameworks

# Planning Platform Support

- What operating system is required?
- What runtimes are required?
- What frameworks are required?
- Is a solution available as an image?
- Does the image meet all requirements?
- Is a server required or can serverless computing be used?

# CAPM

- Cloud Application Management for Platforms (CAPM)
  - Standardized specification for management of applications in the cloud
  - Version 1.2 (2018) specifies APIs used to manage a PaaS implementation
- <http://docs.oasis-open.org/camp/camp-spec/v1.2/camp-spec-v1.2.html>

# Quick Review

- Platforms provide the foundational components required for applications to operate
- Operating systems, runtime environments, and frameworks are included in platforms
- Cloud Application Management for Platforms (CAPM) is an open specification for management of cloud-based applications

# Episode 2.06

## Baselines Lab

# Baselines Defined

- A collection of data providing performance-related trend analysis
  - Normal operations
- Capacity
  - Ability of system to perform at a given level
  - CPU utilization
  - Network utilization
    - Meet demand for data transfer
  - Storage utilization
    - Enough space

# Baselines Defined

- Access times
  - Working hours
    - What is the window of time? 9-5? 24/7?
  - Non-working hours
    - Hours not working
- Baselines define what is normal today
- They can be used to predict the normal of tomorrow

# Hands-On

- Creating a baseline using Windows tools
  - Windows Performance Monitor

# Quick Review

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# Episode 2.07

Target Hosts

# Selecting Target Hosts

- Network latency requirements
  - Bidirectional latency/round trip time (RTT)

# Selecting Target Hosts

- Time-to-deployment
- Replacement cost
  - Cost to replace the system down the road
  - NOTHING in the cloud
- Operational cost
  - Ongoing maintenance and operation on hosts in the cloud
  - Management can be automated in the cloud
    - Patches/updates

# Quick Review

- Network latency is a key factor in selecting hosts for the cloud, hosts requiring very low latency may not operate effectively from the cloud
- A primary motivation of moving to the cloud is hardware replacement costs
- Operational costs are also important to consider, including hardware and software operational costs

# Episode 2.08

## Existing Systems Lab

# What's on Your Network

- Network diagrams
  - (Google a network diagram)
- Inventory collection tools

# Hands-On

- Performing a network inventory
  - Nmap/Zenmap

# Quick Review

- Network diagrams may provide insights into the hosts on your network
- Inventory collection tools can be used to scan the network and locate hosts
- NMAP is an open source scanning tool that can be used to identify hosts, including their operating systems and services, on the network

# **Episode 2.09**

**Architecting for Elements and Targets  
Demo**

# Architecture

- Single
  - One cloud vendor
- Multi
  - Multiple vendors
  - Multiple accounts with one cloud vendor
- All-in
  - All your solutions/networking in the cloud
- Public
- Private
- Hybrid

# Hands-On

- Matching your internal resources to cloud elements/targets

# Quick Review

- A single cloud solution should always be the first consideration as it reduced complexity
- Multiple cloud solutions are sometimes used because of available services and internal expertise
- An all-in cloud solution is used when all systems (except user devices and possibly even those) are moved to the cloud

# **Episode 2.10**

**Selecting Deployment Tools Demo**

# Tools

- Commands
  - Command-line (shell) tools
  - Good for scripting (Python/php)
  - Can run in batch files
  - Automation

# Tools

- Misc. tools
  - 3<sup>rd</sup> party tools
  - After market tools
  - Cloud service provider
  - Interact with manually
- Automation/  
orchestration
  - Get a lot done with little effort

# Tools

- Structure
  - Ex: Virtual Private Clouds in AWS
  - Private subnets/networks
  - Rules across the network

# Hands-On

- AWS tools for deployment
  - CloudFormation

# Quick Review

- Many cloud providers offer command line interface (CLI) tools that can be downloaded and deployed for interactive and scripted administration
- Some third-party tools offer single and multi-cloud management in GUI interfaces with scripting options for automation and orchestration
- Automation is the process of scripting a task so that it is performed without complex interaction
- Orchestration is the automation of multiple tasks or steps for a larger undertaking

# **Episode 2.11**

## **Executing a Deployment Plan Demo**

# Documentation

- Do what is documented
  - Standard operating procedures
- If a necessity is not documented, use change management
  - Gain approval
  - Schedule continuation of execution
  - Document the change
- Complete execute workflow and document the results

# Quick Review

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# **Episode 2.12**

## **Evaluating Testing Plans**

# Cloud Deployment Testing Plan

- A plan to evaluate and ensure the deployment meets requirements
- Possible test considerations
  - Shared components
    - Storage
    - Compute
    - Network
  - Production vs. development vs. QA
  - Automation/orchestration

# Performance Test Factors

- Sizing
- CPU performance
- Read/write performance
- Network performance

# Access Test Factors

- Connectivity
- High availability
- Load balancing
- Replication
- Proper function
- Data integrity

# Quick Review

- A single cloud solution should always be the first consideration as it reduced complexity
- Multiple cloud solutions are sometimes used because of available services and internal expertise
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# **Episode 2.13**

## **Testing Techniques**

# Load Testing

- Ensures the cloud solution can handle the demand
  - Ex: SmartBear LoadNinja
    - Test a load on your network
- Test the following
  - Network connections
  - Response times
  - Availability

# Vulnerability Testing

- A vulnerability is a security weakness that may be exploited
- Reports
- Scans
- Monitoring

# Penetration Testing

- Identify vulnerabilities by attacking your own network
- Network scanning
- Attack software
  - Ex: Metasploit
- Proper procedures
  - Permission
  - Action
  - Report

# Quick Review

- Load testing is used to ensure the cloud solution can keep up with demands
- Vulnerability testing involves scanning the cloud solution for known vulnerabilities
- Penetration testing is an approved and structured attempt at hacking into the cloud solution

# Episode 2.14

Additional Testing Techniques

# Performance Testing

- Load testing
- Stress testing
- Capacity testing
- Endurance testing

# Regression Testing

- Ensures that updates do not crash the solution
- Testing steps:
  - Identify the scope
  - Develop test cases and/or scripts
  - Execute test cases and/or scripts
  - Report issues or bugs
  - Resolve and verify resolutions

# Functional Testing

- Ensures that a solution meets functional requirements

# **Episode 2.15**

**Analyze Testing Results**

# Test Analysis

- Success factor indicators
  - Should be included in the report initially
    - Sizing
    - Performance
    - Availability
    - Connectivity
    - Data integrity
  - Proper functionality

# Testing Actions

- Baseline comparison
- Service Level Agreement (SLA) comparison
- Identify cloud performance fluctuation
  - Latency variables
  - Processing speed variables
- Document results

# Quick Review

- Load testing is used to ensure the cloud solution can keep up with demands
- Vulnerability testing involves scanning the cloud solution for known vulnerabilities
- Penetration testing is an approved and structured attempt at hacking into the cloud solution

# **Episode 2.16**

## **Baseline Confirmation Lab**

# Baseline Confirmation Metrics

- CPU usage
- RAM usage
- Storage usage
- OS and application versions and patch levels
- Network utilization
- Auditing configuration
- Management tool compliance

# Hands-On

- View the baseline document
- Run tests against the cloud in AWS
- Compare the results

# Quick Review

- A baseline confirmation involves comparing the baseline to the actual results
- In addition to performance verification, management tool compliance should be evaluated
- The Performance Monitor can be used in cloud instances of Windows just as in local instances

# **Episode 2.17**

## **Deployment Problem Resolution Lab**

# Problem Detection Actions

- Analyze performance trends
- Compare performance with the baselines
- Compare performance with the SLAs

# Hands-On

- AWS/GCP:
  - Tuning compute
  - Tuning networking
  - Tuning storage
  - Tuning service and application resources

# Recommend Changes

- Scale up/down (vertical)
  - More/less CPU
  - More/less RAM
  - More/less storage
- Scale in/out (horizontal)
  - More/fewer services
  - More/fewer servers
  - More/fewer clouds

# Quick Review

- A baseline confirmation involves comparing the baseline to the actual results
- In addition to performance verification, management tool compliance should be evaluated
- The Performance Monitor can be used in cloud instances of Windows just as in local instances

# Episode 2.18

Importance of High Availability and Scaling

# Hypervisors

- The layer that provides virtualization
  - Type 1
  - Type 2
- Affinity vs. anti-affinity

# Oversubscription

- Virtually allocating collectively more resources than available in the physical hardware
  - Compute
  - Network
  - Storage

# Regions and Zones

- A geographic area where a CSP has one or more data centers is a region
- Specific data centers are zones

# Network Availability

- Switches
- Routers
- Load balancers
- Firewalls

# Applications and Services

- Applications
- Containers
- Clusters

# Scalability

- Auto-scaling
- Horizontal scaling
- Vertical scaling
- Cloud bursting

# Episode 2.19

Determining Cloud Requirements Lab

# Scenario

XYZ International, Inc. desires to implement a cloud solution for their international supply chain management. They wish to track incoming shipments and outgoing shipments using RFID IoT tags. Additionally, they want to track all suppliers and customers in a cloud-based management system and link to the suppliers' inventory systems to be forewarned if the supplier will be unable to fulfill upcoming needs. What kind of cloud services would you suggest as requirements for this scenario?

# Possible Solution

- SaaS
- CSP IoT Services
- CSP Database Solutions
- CSP Serverless Solutions
- CSP Compute Instances
- Integration features for links to suppliers