Chapter 2

System Requirements for Cloud Deployments

2.01 Deployment Exam Objectives Explained

CH02: System Requirements for Cloud Deployments

02.02 Cloud Component Interaction, Part 1
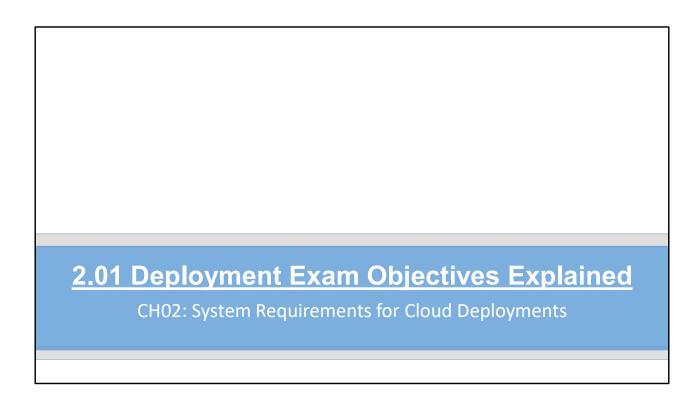
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Network Components

- 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
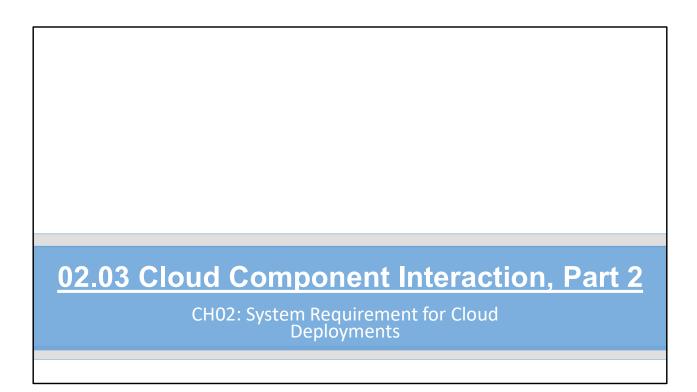 - May be required in your cloud deployment

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?

02.03 Cloud Component Interaction, Part 2

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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
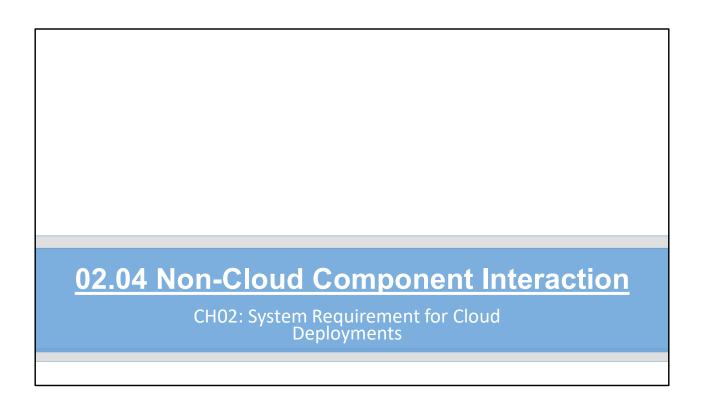
Compute Components

- 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

02.04 Non-Cloud Component Interaction

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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
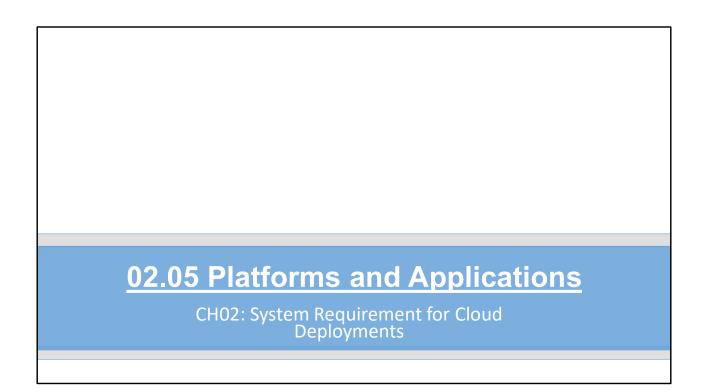 - Storage data center shipped to you via semi truck

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

02.05 Platforms and Applications

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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
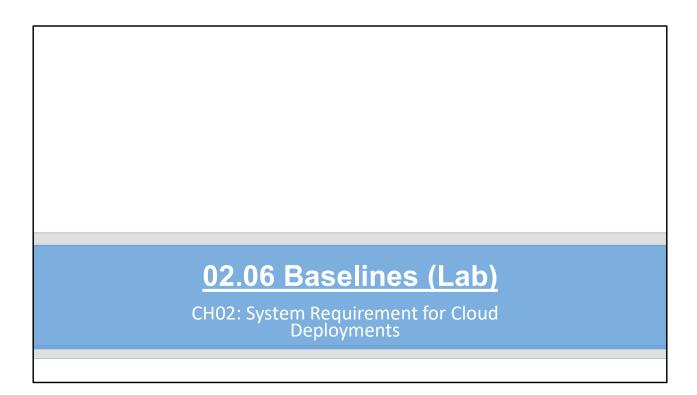
Planning Platform Support

- 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

02.06 Baselines (Lab)

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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

02.07 Target Hosts

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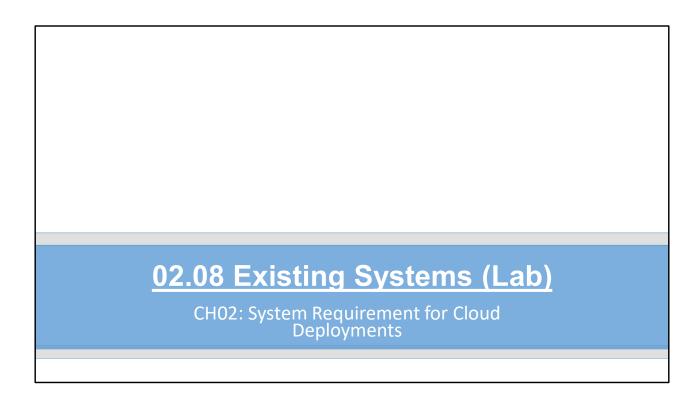
Selecting Target Hosts

- 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
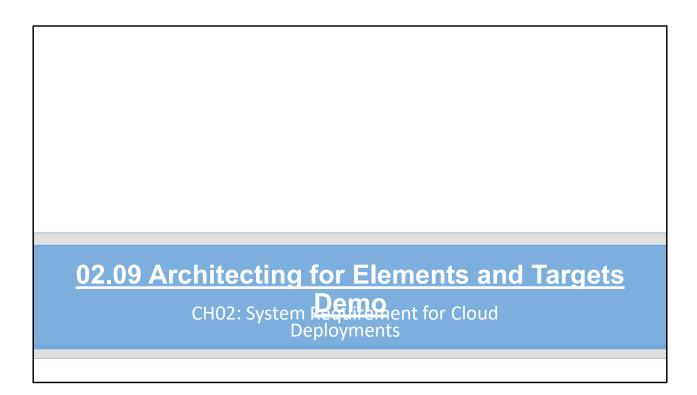 - Management can be automated in the cloud
    - Patches/updates

02.08 Existing Systems (Lab)

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What's on Your Network

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

02.09 Architecting for Elements and Targets Demo

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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

02.10 Selecting Deployment Tools (Demo)

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Tools

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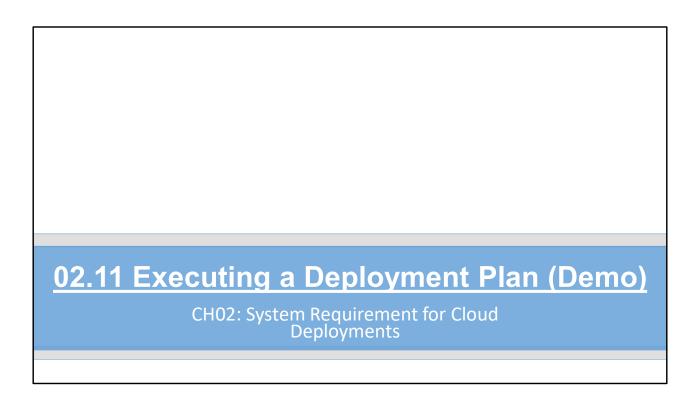 - Automation

Tools

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

<u>Tools</u>

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

02.11 Executing a Deployment Plan (Demo)

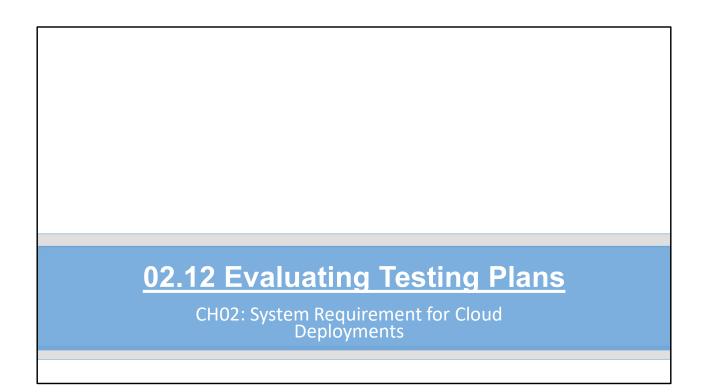## CH02: System Requirement for Cloud Deployments

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

02.12 Evaluating Testing Plans

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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

02.13 Testing Techniques

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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
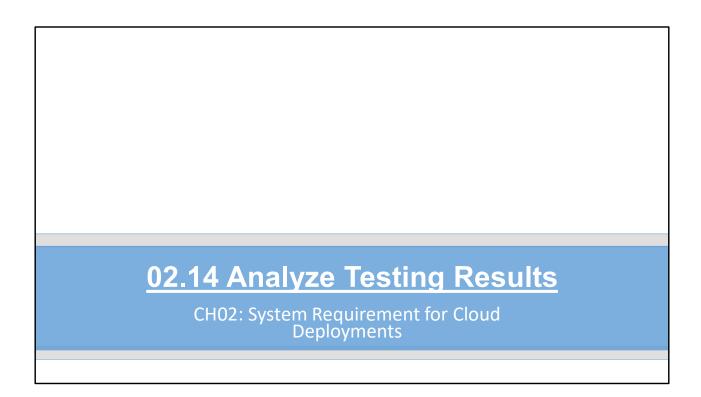- Reports
- Scans
- Monitoring

Penetration Testing

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

02.14 Analyze Testing Results

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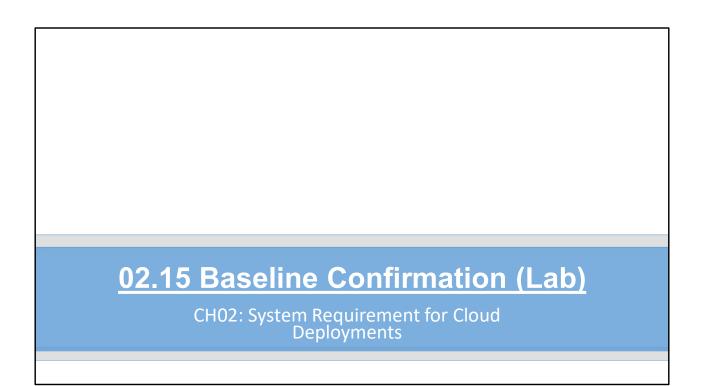
Test Analysis

- 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

02.15 Baseline Confirmation (Lab)

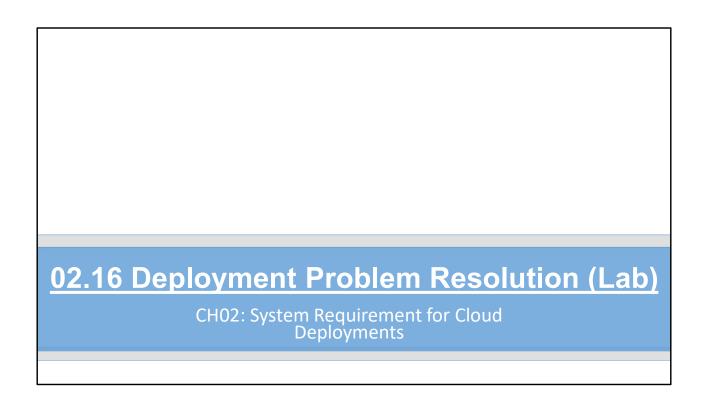CH02: System Requirement for Cloud Deployments

Baseline Confirmation Metrics

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

02.16 Deployment Problem Resolution (Lab)

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Problem Detection Actions

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

TOTAL
Seminars

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