Operational Excellence with AWS

CHAPTER 15

Episode

The Operational Excellence Process

Objectives/Task Statements Covered

Well-Architected Framework

- Operational Excellence
- Security
- Reliability
- Performance Efficiency
- Cost Optimization

Operational Excellence Process

- Prepare
- Operate
- Evolve

Prepare

- Understand workloads and expected behaviors
- Considerations
  - Operational priorities
  - Design for operations
  - Operational readiness

Operate

- Monitor
  - Environment health
  - Discover business and technical insights
- Respond
  - Security
  - Reliability
  - Performance
  - Cost

Evolve

- Learn from experience
- Share learning
- Improve
- Scale

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Well-Architected Scenario

Objectives/Task Statements Covered

Widget Makers

- Currently managing all servers, databases, storage and applications on-premises
- Desires to take advantage of the AWS cloud
- Goal is a cloud-first design
  - Move anything that can be in the cloud to the cloud

Order Processing

- Client application
  - Communicates with Microsoft SQL Server database
  - Used by 93 employees
- Server functions
  - Database operations
  - Stored procedures

Inventory Management

- Web-based interface used by less than a dozen users
- Based on a MySQL database
- Handles both raw materials and finished products
- Replicates into the order processing database

Payroll

- Time clock-based
  - Time clock is a scanning system based on ID cards
  - Communicates with a SQL Server backend database
- Tracking and payment
  - Managers can see tracking information
  - Accounting processes payroll

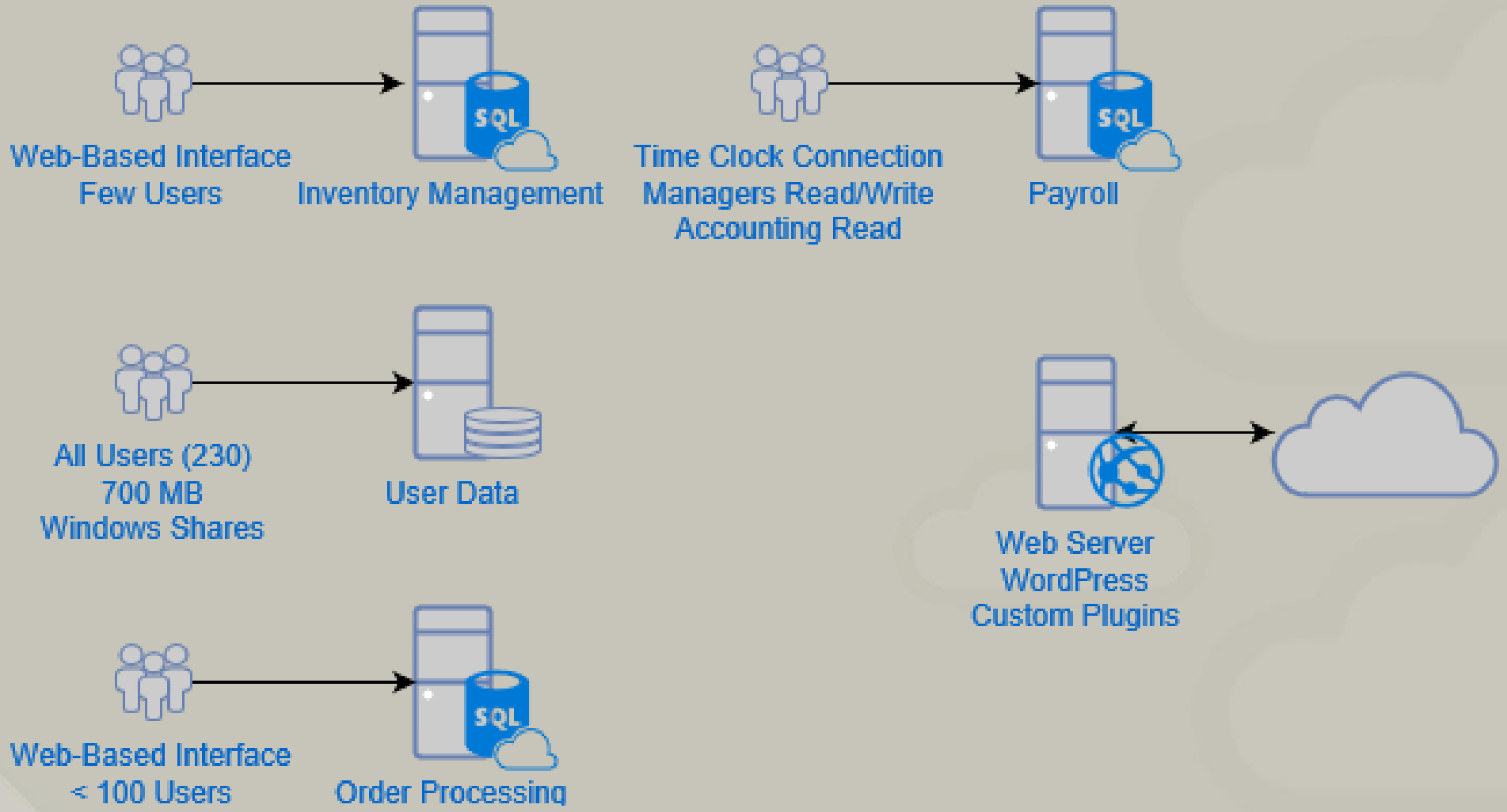
User Data

- Stored on Windows-based file servers
- User directories map to the system F: drive
- Approximately 700 MB of data per user with 230 users
  - Total of 160 GB storage

Website

- Average of 3400 visitors per day M-F and 600 per day on weekends
- Currently driven by WordPress and custom plugins
- No content outside of WordPress

Widget Makers Today



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Resilient Design

Objectives/Task Statements Covered

Resilient Design

- Provides reliability
- Automation
  - Recovery
  - Scaling
- Automatic recovery from failures
- Automatic scaling for peak workloads
- Data recovery from effective backup plans

Reliable Design Principles

- Test recovery procedures
- Automatically recover from failure
- Scale horizontally – from one large to many small
- Stop guessing capacity
- Automate change

AWS Reliable Design Principles

- AWS-Reliability-Pillar.pdf

- Test recovery procedures
- Automatically recover from failure
- Scale horizontally – from one large to many small
- Stop guessing capacity
- Automate change

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Resilient Design Scenario

Objectives/Task Statements Covered

Widget Makers Resilient Plan

- Order processing
  - Continue on SQL Server RDS instance in the cloud
  - Use a Multi-AZ database
- Inventory management
  - Continue on MySQL RDS instance in the cloud
  - No clustering required
  - Use a Multi-AZ database
- Payroll
  - Continue on SQL Server in the cloud
  - Use a Multi-AZ database
  - Implement a read replica for payroll processing

Widget Makers Resilient Plan

- User data
  - Change to S3 buckets
  - Third-party tools allow drive mapping (not tested on exam)
- Website
  - Continue operations on WordPress
  - Move to an ELB deployment with two servers

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Performant Design

Objectives/Task Statements Covered

AWS Performant Design

- AWS-Performance-Efficiency-Pillar.pdf

- Consume advanced technologies managed in the cloud
- Deploy to multiple regions
- Use serverless architectures
- Experiment with game days

Auto Scaling

- The key to performant design in the cloud
- EC2 instances can be scaled automatically
  - Logging of scale actions should be in place
- Database services can be scaled quickly
  - Monitoring should be in place

Choosing Performant Storage

Storage	Services	Latency	Throughput	Shareable
Block	EBS, EC2 instance store	Lowest, consistent	Single	Mounted on single instance, copies via snapshots
File system	EFS	Low, consistent	Multiple	Many clients
Object	S3	Low-latency	Web scale	Many clients
Archival	Glacier	Minutes to hours	High	No

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Performant Design Scenario

Objectives/Task Statements Covered

Widget Makers Performant Plan

- Order processing
  - Ensure instances are in a class providing sufficient memory and processing capabilities
- Inventory management
  - Ensure instances are in a class providing sufficient memory and processing capabilities
  - Automate inventory management using SNS messages
- Payroll
  - Ensure instances are in a class providing sufficient memory and processing capabilities
  - Perform payroll processing only from the read replica

Widget Makers Performant Plan

- User data
  - Implement departmental S3 buckets for improved performance and management
  - Configure alarms to notify administrators of users exceeding 700 MB storage
- Website
  - Ensure instances are in a class providing sufficient memory and processing capabilities
  - Use ELB volumes to maintain state and enhance performance

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Secure Design

Objectives/Task Statements Covered

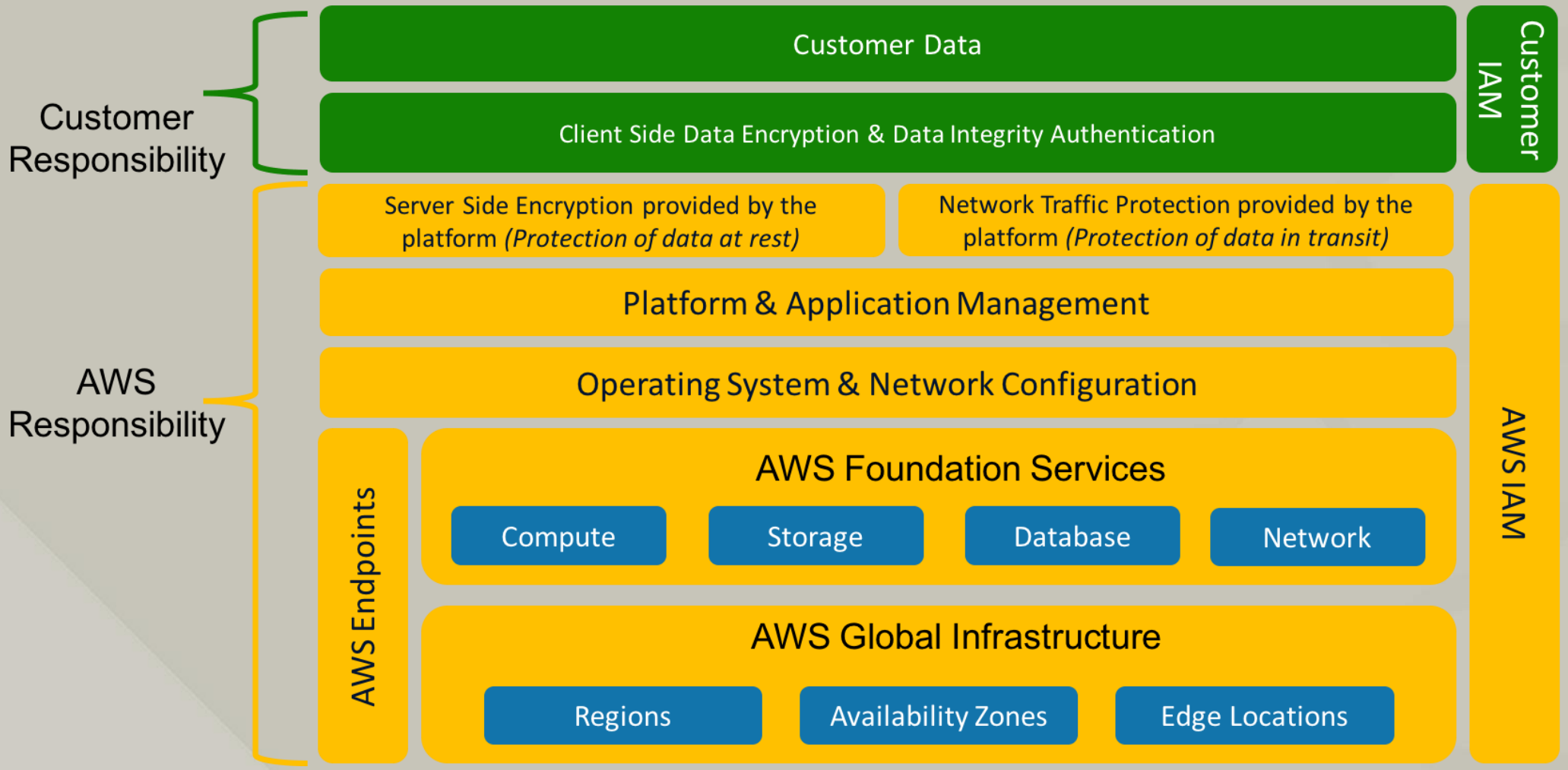
AWS Secure Design

- AWS-Security-Pillar.pdf
  - Implement a strong identity foundation
  - Enable traceability
  - Apply security at all layers
  - Automate security best practices
  - Protect data in transit and at rest

Security in the Cloud

- Identity and access management (IAM)
- Detective controls
- Infrastructure protection
- Data protection
- Incident response

Shared Responsibility Model



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Secure Design Scenario

Objectives/Task Statements Covered

Widget Makers Security Plan

- Order processing
  - Secure database management through IAM groups and policies
  - Implement internal security features of the target database
  - Secure the client application in local deployment
- Inventory management
  - Secure database management through IAM groups and policies
  - Implement internal security features of the target database
- Payroll
  - Secure database management through IAM groups and policies
  - Ensure only accounting employees can access read replicas
  - Implement internal security features of the target database

Widget Makers Security Plan

- User data
  - Implement appropriate security policies on the S3 buckets
  - Encrypt the data stored at rest in the buckets
  - Use SSL for data transfers
- Website
  - Run the web server instances with appropriate roles to access only required AWS resources
  - Ensure proper security group configuration for the network interfaces
  - Ensure proper security group configuration for the VPC

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Cost Optimization

Objectives/Task Statements Covered

AWS Cost Optimization

- AWS-Cost-Optimization-Pillar.pdf
  - Consumption model
  - Measure overall efficiency
  - Stop spending on data center operations
  - Analyze and attribute expenditure
  - Use managed services

Four Pillars

- Cost-effective resources
- Matching supply with demand
- Expenditure awareness
- Optimizing over time

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Cost Optimization Scenario

Objectives/Task Statements Covered

Widget Makers Cost Plan

- Order processing
  - Use a managed database
- Inventory management
  - Use a managed database
- Payroll
  - Use a managed database
  - Use the read replica as needed

Widget Makers Cost Plan

- User data
  - Monitor use
  - Address overuse
- Website
  - Use the right instance class
  - Monitor access
  - Address improper access

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General Best Practices

Objectives/Task Statements Covered

Design for Failures

- Clustering
- Availability Zones
- Backups
- Alternate AWS accounts
- CloudFormation templates

Implement Elasticity

- Auto Scaling
- Elastic Load Balancing
- Decoupled applications
- Run tasks in parallel

Learn

- AWS free tier account
- Practice
  - Build entire solutions
  - Configure every option
  - Tear down
  - Start again
- Try different solutions