Course Outline

AWS Academy Cloud Architecting

Course Version

This course outline applies to version 1.1 of *AWS Academy Cloud Architecting* in English.

Description

AWS Academy Cloud Architecting covers the fundamentals of building IT infrastructure on AWS. The course is designed to teach solutions architects how to optimize their use of the AWS Cloud by understanding AWS services and how they fit into cloud-based solutions. Although architectural solutions can differ depending on the industry, type of application, and size of the business, this course emphasizes best practices for the AWS Cloud that apply to all of them. It also recommends various design patterns to help you think through the process of architecting optimal IT solutions on AWS. Throughout the course, students will explore case studies that showcase how some AWS customers have designed their infrastructures and the strategies and services that they have implemented. Finally, this course provides opportunities for students to build a variety of infrastructures through a guided, hands-on approach.

Course Objectives

Upon completion of this course, students will be able to:
- Describe how cloud adoption transforms the way IT systems work
- Describe the benefits of cloud computing with Amazon Web Services
- Discuss how to design systems that are secure, reliable, high-performing, and cost efficient
- Describe principles to consider when migrating or designing new applications for the cloud
- Identify the design patterns and architectural options applied in a variety of use cases
- Define high availability, fault tolerance, and scalability
- Discuss how to avoid single points of failure
- List AWS services that have built-in fault tolerance or can be designed for fault tolerance
- Describe why load balancing is a key architectural component for AWS-powered applications
- Identify the benefits of Infrastructure as Code
- Describe how to leverage the capabilities of AWS to support automation
- Create, manage, provision, and update related resources using AWS CloudFormation
- Articulate the importance of making systems highly cohesive and loosely coupled
- Describe system coupling to support the distributed nature of applications built for the cloud
- Describe database services for storing and deploying web-accessible applications
- Compare structured query language (SQL) databases with NoSQL databases
- Describe how the AWS Well-Architected Framework improves cloud-based architectures
- Describe the business impact of design decisions
- Identify the design principles and best practices of the Operational Excellence pillar
- Describe how to secure data at every layer in the application
- Describe the appropriate tools and services to provide security-focused content
- Describe the design principles and best practices of the Reliability pillar.
- Select compute, storage, database, and networking resources to improve performance
- Evaluate the most important performance metrics for your applications
- Follow best practices to eliminate unneeded costs or suboptimal resources
- Troubleshoot common errors

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Duration

Approximately 40 Hours. Total course duration when delivered by an educator: 38.5 hrs. Total digital training duration: 12 hrs. Actual delivery times will vary from class to class and depending on delivery format. This course must be delivered over a period of at least six weeks.

Intended Audience

This advanced (level 200) course is intended for students attending AWS Academy member institutions.

Student Prerequisites

To ensure success in this course, students should have:
- Completed *AWS Academy Cloud Foundations* (ACF) or have equivalent experience
- A working knowledge of distributed systems
- Familiarity with general networking concepts
- A working knowledge of multi-tier architectures
- Familiarity with cloud computing concepts

Delivery Methods

This course can be delivered with local and/or remote students as synchronous lectures, or students can independently complete digital training modules.

Educator Prerequisites

Educators must hold a current AWS Certified Solutions Architect – Associate certification.

Educator Accreditation

Educators must meet the prerequisites and have completed Technical Validation with an AWS Academy Technical Program Manager. Educators who hold accreditation for the AWS Cloud Computing Architecture (CCA) course are also accredited for this course.

Learning Resources

- Lecture materials
- Online multiple-choice knowledge checks
- Lab exercises
- Digital training (optional)
- Video introductions
- Video demos
- Example solutions
- Discussions

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Course Contents

Digital training materials cover the same content as the lectures. It is not necessary to use both.

		Lecture	Digital Training	Exercise & Lab	Knowledge Check
Course Introduction					
Video	Course Introduction Video Part 1				
Video	Course Introduction Video Part 2				
AWS Review (optional)		30 min.			
Lecture	Introduction to AWS Cloud				
Lecture	Cloud Scenarios				
Lecture	Infrastructure Overview				
Lecture	Introduction to AWS Foundation Services				
Module 1 – Welcome to AWS Academy Cloud Architecting		170 min.	25 min.		
Lecture	Course Prerequisites, Objectives, Overview				
Lecture	Creating Your AWS Training Portal Account				
Lecture	Accessing Your Course Materials				
Digital Training	Welcome to AWS Academy Cloud Architecting				
Module 2 – Designing Your Environment		230 min.	70 min.	20 min.	10 min.
Lecture	Choosing a Region				
Lecture	Selecting Availability Zones				
Lecture	Virtual Private Cloud (VPC)				
Lecture	Dividing VPCs and Subnets				
Lecture	Default VPCs and Default Subnets				
Lecture	Controlling VPC Traffic				
Lecture	Connecting Multiple VPCs				
Lecture	Integrating On-premises Components				
Lecture	VPC Best Practices				
Digital Training	Designing Your Environment				
Exercise	Improve This Architecture				
Knowledge Check	Designing Your Environment				
Module 3 – Designing for High Availability I		180 min.	55 min.	135 min	10 min.
Lecture	Load Balancing and Fault Tolerance				
Exercise	Improve This Architecture				
Lecture	High Availability Across Regions				
Lecture	Connections Outside of Amazon VPC				
Digital Training	Designing for High Availability I				
Lab	Making Your Environment Highly Available			60 min.	
Discussion	Forklifting and Existing Application			75 min.	
Knowledge Check	Designing for High Availability I				
Module 4 – Designing for High Availability II		185 min.	60 min.	50 min.	10 min.
Lecture	Best Practice – Scalability				
Lecture	Determining if Scaling is Needed				
Lecture	Automatic Scaling				
Exercise	Improve This Architecture			20 min.	
Lecture	Scaling Data Stores				
Lecture	AWS Lambda and Event Driven Scaling				

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Digital Training	Designing for High Availability II				
Lab	Using Auto Scaling with AWS Lambda			30 min.	
Knowledge Check	Designing for High Availability II				
Module 5 – Automating Your Infrastructure		150 min.	55 min.		10 min.
Lecture	Manual Environment Configuration				
Lecture	Infrastructure as code on AWS				
Lecture	Grouping resources in a template				
Lecture	Resources not supported by AWS CloudFormation				
Digital Training	Automating Your Infrastructure				
Lab	Automating Infrastructure Deployment with AWS CloudFormation				
Knowledge Check	Automating Your Infrastructure				
Module 6 – Decoupling Your Infrastructure		200 min.	65 min.		10 min.
Lecture	Loose Coupling				
Lecture	Loose Coupling Strategies				
Lecture	Communicating Easily and Reliably Among Components				
Lecture	Communicating with Loose Coupling and Amazon DynamoDB				
Lecture	Amazon API Gateway				
Lecture	Serverless Architectures				
Lecture	Decoupling Examples				
Lab	Decoupling Your Infrastructure				
Knowledge Check	Decoupling Your Infrastructure				
Module 7 – Designing Web-Scale Media		175 min.	55 min.	45 min.	10 min.
Lecture	Storing Web-Accessible Content with Amazon S3				
Lecture	Caching with Amazon CloudFront				
Lecture	Managing NoSQL Databases				
Lecture	Storing Relational Data in Amazon RDS				
Lab	Implementing a Serverless Architecture with AWS Managed Services				
Digital Training	Designing Web-Scale Media				
Discussion	Scalable Web Application				
Knowledge Check	Designing Web-Scale Media				
Project Presentation	Designing a Cloud Solution				
Module 8 – Well Architected Framework		75 min.	25 min.		10 min.
Video	Well-Architected Framework Introduction Video				
Lecture	Introduction to the Well-Architected Framework				
Lecture	Pillars of the Well-Architected Framework				
Lecture	Well-Architected Design Principles				
Digital Training	Well-Architected Framework				
Knowledge Check	Well-Architected Framework				
Module 9 – Well-Architected Pillar 1: Operational Excellence		75 min.	25 min.		10 min.
Lecture	Principles of the Operational Excellence Pillar				

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Lecture	Drive Operational Excellence				
Lecture	Operational Excellence Pillar Questions				
Module 10 – Well-Architected Pillar 2: Security		240 min	90 min.	30 min.	10 min.
Lecture	Principles of the Security Pillar				
Lecture	Preventing Common Security Exploits				
Lecture	Securing Data in CloudFront				
Lecture	Encrypting Data				
Lecture	Authentication				
Lab	Introduction to Amazon CloudFront				
Digital Training	Well-Architected Pillar 2: Security				
Knowledge Check	Well-Architected Pillar 2: Security				
Module 11 – Well-Architected Pillar 3: Reliability		144 min.	25 min.	65 min.	10 min.
Lecture	Principles of the Reliability Pillar				
Lecture	Making Your Infrastructure More Reliable				
Exercise	Improve This Architecture			20 min.	
Lecture	Reliability Pillar Questions				
Lab	Multi-Region Failover With Amazon Route 53			45 min.	
Digital Training	Well-Architected Pillar 3: Reliability				
Knowledge Check	Well-Architected Pillar 3: Reliability				
Module 12 – Well-Architected Pillar 4: Performance Efficiency		80 min.	20 min.	30 min.	10 min.
Lecture	Principles of the Performance Efficiency Pillar				
Lecture	Infrastructure Efficiency Improvements				
Exercise	Improve This Architecture				
Lecture	Performance Efficiency Pillar Questions and Best Practice				
Digital Training	Well-Architected Pillar 4: Performance Efficiency				
Knowledge Check	Well-Architected Pillar 4: Performance Efficiency				
Module 13 – Well-Architected Pillar 5: Cost Optimization		185 min.	50 min.	30 min.	10 min.
Lecture	Principles of the Cost Optimization Pillar				
Lecture	Optimizing the Cost of Your Infrastructure				
Lecture	Dedicated Instances and Dedicated Hosts				
Lecture	Trusted Advisor				
Lecture	Optimizing Costs with Caching				
Lecture	AWS Cost Calculation Tools				
Exercise	Improve This Architecture				
Lecture	Cost Optimization Questions				
Digital Training	Well-Architected Pillar 5: Cost Optimization				
Knowledge Check	Well-Architected Pillar 5: Cost Optimization				
Module 14 - Troubleshooting		85 min.	15 min.		10 min.
Lecture	Troubleshooting Steps				
Lecture	AWS Support Options				
Digital Training	Troubleshooting				
Knowledge Check	Troubleshooting				
Module 15 – Design Patterns and Sample Architectures		130 min.	40 min.		10 min.

Lecture	High-Availability Design Patterns				
Lecture	Stream Processing Example				
Lecture	Sensor Network Data Ingestion and Processing Example				
Lecture	Application Backend Example				
Lecture	Transcoding and Serving Video Files Example				
Digital Training	Design Patterns and Sample Architectures				
Knowledge Check	Design Patterns and Sample Architectures				
Project Lab	GoGreen Insurance Company				
Recommended and Optional					
Lab	Sandbox				

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Appendix - Module Objectives

Module 0 – Review
This module shares an overview of cloud concepts and Amazon Web Services. This module is optional depending on student's key areas of interest, expectations, and level of experience.

Upon completing this module, students will be able to:
- Explain how cloud adoption transforms the way IT systems work.
- Describe the benefits of cloud computing with Amazon Web Services.

Module 1 - Welcome to AWS Academy Cloud Architecting
This module provides an overview of the *AWS Academy Cloud Architecting* and reviews course objectives. It will walk students through the creation of their AWS accounts, used throughout the course to enhance the cloud learning journey.

Upon completing this module, students will be able to:
- Create an AWS training portal account.
- Understand how to access course materials.
- Create an AWS Free Tier account and an AWS Educate account (Optional).

Module 2 - Designing Your Environment
This module guides you through how architects design their Amazon Web Services, or AWS, environments. It also establishes guidelines and patterns for selecting AWS Regions, Availability Zones, Multi-Accounts, Multi-VPCs, and subnet structures. These concepts are conveyed through a mixture of recommendations, best practices, design patterns, and questions meant to be used by architects to determine the full requirements of their solution.

Upon completing this module, students will be able to:
- Discuss how to design systems that are secure, reliable, high performing, and cost efficient.
- Highlight principles to consider when migrating existing applications to AWS or designing new applications for the cloud.
- Identify design patterns and architectural options that can be applied in a variety of use cases.

Module 3 - Designing for High Availability - Section I
This module builds on the Designing Your Environment content and explains the concepts of high availability and fault tolerance. Elastic Load Balancing and Amazon Route 53 are discussed as options for implementing a single hostname that can communicate with multiple endpoints. Concepts are reinforced with an exercise to improve an architecture, along with a group discussion to forklift an existing application.

Upon completing this module, students will be able to:
- Define high availability, fault tolerance, and scalability, and discuss how those concepts are used in cloud architecture.
- Discuss how to avoid single points of failure.
- Identify which AWS services have built-in fault tolerance, and which services can be designed for fault tolerance.

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- Explain why load balancing has become a key architectural component for many AWS-powered applications.

Module 4 - Designing for High Availability - Section II
This module builds on Module 3 and explores the best practices to "Avoid Single Points of Failure." Elastic Load Balancing and Amazon Route 53 are further discussed and concepts are reinforced with another exercise and a lab that uses Auto-Scaling with AWS Lambda.

Upon completing this module, students will be able to:
- Define high availability, fault tolerance, and scalability, and discuss how those concepts are used in cloud architecture.
- Discuss how to avoid single points of failure.
- Identify which AWS services have built-in fault tolerance and which can be designed for fault tolerance.
- Explain why load balancing has become a key architectural component for many AWS-powered applications.

Module 5 - Automating Your Infrastructure
This module provides an in-depth analysis of microservices and serverless architectures to explain how they can make the infrastructure more resilient and cost effective. The goal of this module is to teach the fundamental concepts of these non-traditional approaches to deploying applications.

Upon completing this module, students will be able to:
- Identify the benefits of Infrastructure as Code.
- Describe how to leverage the capabilities of Amazon Web Services to support automation.
- Discuss to how create, manage, provision, and update a collection of related AWS resources in an orderly and predictable way with AWS CloudFormation.

Module 6 - Decoupling Your Infrastructure
This module teaches decoupling design patterns and the need for reducing interdependencies between tiers. Students will learn best practices for using microservices and designing solutions with components.

Upon completing this module, students will be able to:
- Articulate the importance of making systems highly cohesive and loosely coupled.
- Recall the multi-dimensional facets of system coupling to support the distributed nature of applications built for the cloud.

Module 7 - Designing Web-Scale Media
Module 7 answers the question "How do I make sure that I am using my storage in the most efficient and available way so that my applications run faster and my users have a better experience." Students will perform a lab that implements a serverless architecture with AWS managed services.

Upon completing this module, students will be able to:
- Discover database services for storing and deploying web-accessible content quickly and cost-effectively.

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- Identify key features and benefits of Amazon S3, CloudFront, Amazon RDS, and Amazon Aurora.
- Compare structured query language—or SQL—databases with NoSQL databases.

Module 8 - Is Your Infrastructure Well-Architected?
The goal of this module is to introduce the Well-Architected Framework, and to provide a quick overview of each of its five pillars. A deeper explanation of each pillar will be included in the upcoming modules.

Upon completing this module, students will be able to:
- Identify the five pillars of the Amazon Web Services Well-Architected Framework.
- Identify how the AWS Well-Architected Framework enables you to review and improve cloud-based architectures.
- Reflect on the business impact of your design decisions.

Module 9 - Well-Architected Pillar 1: Operational Excellence
This module focuses on the Operational Excellence pillar of the Well-Architected Framework. Operational excellence is challenging to achieve in traditional on-premises environments, where operations is perceived as a function that is isolated and distinct from the lines of business and development teams that it supports. By adopting these practices, you can build architectures that provide insight to their status, are enabled for effective and efficient operation and event response, and can continue to improve and support the goals of the business.

Upon completing this module, students will be able to:
- Describe the benefits and application of the Operational Excellence pillar, such as running and monitoring systems that will deliver business value, and continually improve processes and procedures.
- Identify the design principles and best practices of the Operational Excellence pillar.

Module 10 - Well-Architected Pillar 2: Security
Module 10 focuses on the second pillar of the Well-Architected Framework: Security. Best practices are discussed, and you will learn how to secure data at every layer in the application. You'll participate in an exercise to recommend security enhancements in accordance with the security pillar.

Upon completing this module, students will be able to:
- Describe how to secure data at every layer in the application.
- Identify the appropriate tools and services to provide security focused content.
- Identify the design principles and best practices of the Security pillar.

Module 11 - Well-Architected Pillar 3: Reliability
This module highlights the third pillar of the Well-Architected Framework: Reliability. Best practices are shared with AWS tools to improve system reliability. You will review example architectural patterns for implementing a reliable solution and perform a Lab: Multi-Region Failover with Amazon Route 53.

Upon completing this module, students will be able to:

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- Describe the ability of a system to recover from infrastructure or service disruptions, dynamically acquire computing resources to meet demand, and mitigate disruptions such as misconfigurations or transient network issues.
- Identify the design principles and the best practices of the Reliability pillar.

Module 12 - Well-Architected Pillar 4: Performance Efficiency
This module provides in-depth insight into the Performance Efficiency pillar of the Well-Architected Framework. While many best practices are discussed, this module focuses on how to tune or offload components of your system to improve performance. You will participate in an exercise to improve an architecture.

Upon completing this module, students will be able to:
- Select compute, storage, database, and networking resources to improve your architecture's performance.
- Identify design principles that can help you achieve performance efficiency.
- Evaluate the most important performance metrics for your applications.

Module 13 - Well-Architected Pillar 5: Cost-Optimization
This module focuses on the Cost Optimization pillar of the Well-Architected Framework. Discover best practices, how to procure
Amazon Elastic Compute Cloud instances for the lowest cost, and how to analyze or audit your resources for inefficient costs or budget overruns. Before finalizing, you'll participate in an exercise to improve an architecture.

Upon completing this module, students will be able to:
- Understand the principles of the cost optimization pillar.
- Discover how to optimize the costs of your infrastructure.
- Follow best practices to eliminate unneeded costs or suboptimal resources.

Module 14 - Troubleshooting
The goal of this module is to provide you with common troubleshooting errors with best practices in how to resolve. You'll be introduced to services that provide you with direct access to an agent to help optimize costs in identifying underused resources, and guidance on getting the optimal performance and availability of your architecture based on your requirements.

Upon completing this module, students will be able to:
- Troubleshoot common errors.
- Access various AWS Support Options.

Module 15 - Design Patterns and Sample Architectures
This module re-visits the architecture patterns with a re-cap of common design patterns. You'll discover how to implement services to the design patterns and visualize an entire solution using AWS services.

Upon completing this module, students will be able to:
- Understand high-availability design patterns.

- Review various scenarios with examples of sample architectures.